ENCYCLOPÆDIA BRITANNICA.

Suicide.

SUICIDE, the crime of ſelf-murder, or the perſon who commits it.

We have often wiſhed to ſee a hiſtory of crimes drawn up by a man of ability and reſearch. In this hiſtory we would propoſe that the author ſhould deſcribe the crimes peculiar to different nations in the different ſtages of ſociety, and the changes which they undergo in the progreſs of civilization. After having arranged the hiſtorical facts, he might, by comparing them with the religion and the knowledge of the people, deduce ſome important general concluſions, which would lead to a diſcovery of the cauſe of crimes, and of the remedy moſt proper to be applied. Some crimes are peculiar to certain ſtages of ſociety, ſome to certain nations, &c.

1 Suicide among the Jews.

Suicide is one of thoſe crimes which we are led to believe not common among ſavage nations. The firſt inſtances of it recorded in the Jewiſh hiſtory are thoſe of Saul and Ahitophel; for we do not think the death of Samſon a proper example. We have no reaſon to ſuppoſe that it became common among the Jews till their wars with the Romans, when multitudes ſlaughtered themſelves that they might not fall alive into the hands of their enemies. But at this period the Jews were a moſt deſperate and abandoned race of men, had corrupted the religion of their fathers, and rejected that pure ſyſtem which their promiſed Meſſiah came to Jeruſalem to announce.

2 Among the Greeks.

When it became remarkable among the Greeks, we have not been able to diſcover; but it was forbidden by Pythagoras, as we learn from Athenæus, by Socrates and Ariſtotle, and by the Theban and Athenian laws. In the earlieſt ages of the Roman republic it was ſeldom committed; but when luxury and the Epicurean and Stoical philoſophy had corrupted the ſimplicity and virtue of the Roman character; then they began to ſeek ſhelter in ſuicide from their misfortunes or the effects of their own vices.

3 The Bramins and Gentoos.

The religious principles of the bramins of India led them to admire ſuicide on particular occaſions as honourable. Accuſtomed to abſtinence, mortification, and the contempt of death, they conſidered it as a mark of weakneſs of mind to ſubmit to the infirmities of old age. We are informed that the modern Gentoos, who ſtill in moſt things conform to the cuſtoms of their anceſtors, when old and infirm, are frequently brought to the banks of rivers, particularly to thoſe of the Ganges, that they may die in its ſacred ſtreams, which they believe can waſh away the guilt of their ſins. But the maxims of the bramins, which have encouraged this practice, we are aſſured by Mr Holwell, are a corruption of the doctrines of the Shaſtah, which poſitively forbid ſuicide under the ſevereſt puniſhment. The practice which religion or affection has eſtabliſhed among the Gentoos, for women at the death of their huſbands to burn themſelves alive on the funeral pile, we do not think ought to be conſidered as ſuicide, as we are not anxious to extend the meaning of the word; for were we to extend it thus far, it would be as proper to apply it to thoſe who chooſe rather to die in battle than make their eſcape at the expence of their honour. Thus we ſhould condemn as ſuicides the brave Spartans who died at Thermopylæ in defence of their country; we ſhould alſo be obliged to apply the ſame diſgraceful epithet to all thoſe well-meaning but weak-minded Chriſtians in this iſland, who in the laſt century choſe rather to die as martyrs than comply with commands which were not morally wrong. According to the Gentoo laws, "it is proper for a woman after her huſband's death to burn herſelf in the fire with his corpſe. Every woman who thus burns ſhall remain in paradiſe with her huſband three crore and fifty lacks of years. If ſhe cannot, ſhe muſt in that caſe preſerve an inviolable chaſtity. If ſhe remain chaſte, ſhe goes to paradiſe; and if ſhe do not preſerve her chaſtity, ſhe goes to hell."

Suicide. *Sullivan's Phil. Rhap.* vol. ii. *Holwell's Intereſting Events*, &c. vol. i.

4 Among the Americans, *Robertſon's America.*

A cuſtom ſimilar to this prevailed among many nations on the continent of America. When a chief died, a certain number of his wives, of his favourites, and of his ſlaves, were put to death, and interred together with him, that he might appear with the ſame dignity in his future ſtation, and be waited upon by the ſame attendants. This perſuaſion is ſo deeply rooted, that many of their retainers offer themſelves as victims; and the ſame cuſtom prevails in many of the negro nations in Africa.

5 The Japaneſe, and

If we can believe the hiſtorians of Japan, voluntary death is common in that empire. The devotees of the idol Amida drown themſelves in his preſence, attended by their relations and friends, and ſeveral of the prieſts, who all conſider the devoted perſon as a ſaint who is gone to everlaſting happineſs. Such being the ſuppoſed honours appropriated to a voluntary death, it is not ſurpriſing that the Japaneſe anxiouſly cheriſh a contempt of life. Accordingly it is a part of the education of their children "to repeat poems in which the virtues of their anceſtors

Raynal's Hiſt. of the Eaſt and Weſt Indies, vol. ii.

Suicide.

ancestors are celebrated, an utter contempt of life is inculcated, and suicide is set up as the most heroic of actions."

6 Scythians,

A notion seems also to have prevailed among the ancient Scythian tribes, that it was pusillanimous and ignoble for a man whose strength was wasted with disease or infirmity, so as to be useless to the community, to continue to live. It was reckoned an heroic action voluntarily to seek that death which he had not the good fortune to meet in the field of battle. Perversion of moral feeling does not spring up, we hope, spontaneously in any nation, but is produced by some peculiarities of situation. A wandering people like the Scythians, who roamed about from place to place, might often find it impossible to attend the sick, or to supply from their precarious store the wants of the aged and infirm. The aged and infirm themselves, no longer able to support the character of warriors, would find themselves unhappy. In this way the practice of putting to death such persons as were useless to the community might originate, and afterwards be inculcated as honourable; but he who put an end to his infirmities by his own hand, obtained a character still more illustrious.

7 and Scandinavians.

The tribes of Scandinavia, which worshipped Odin the "father of slaughter," were taught, that dying in the field of battle was the most glorious event that could befal them. This was a maxim suited to a warlike nation. In order to establish it more firmly in the mind, all were excluded from Odin's feast of heroes who died a natural death. In Asgardia stood the hall of Odin; where, seated on a throne, he received the souls of his departed heroes. This place was called *Valhalla*, signifying "the hall of those who died by violence." Natural death being thus deemed inglorious, and punished with exclusion from Valhalla the paradise of Odin, he who could not enjoy death in the field of battle was led to seek it by his own hands when sickness or old age began to assail him. In such a nation suicide must have been very common.

8 It prevailed much in the decline of the Roman empire.

As suicide prevailed much in the decline of the Roman empire, when luxury, licentiousness, profligacy, and false philosophy, pervaded the world, so it continued to prevail even after Christianity was established. The Romans, when they became converts to Christianity, did not renounce their ancient prejudices and false opinions, but blended them with the new religion which they embraced. The Gothic nations also, who subverted the Roman empire, while they received the Christian religion, adhered to many of their former opinions and manners. Among other criminal practices which were retained by the Romans and their conquerors, that of suicide was one; but the principles from which it proceeded were explained, so as to appear more agreeable to the new system which they had espoused. It was committed, either to secure from the danger of apostacy, to procure the honour of martyrdom, or to preserve the crown of virginity.

9 Too common in modern times, but not more so in England than in other countries,

When we descend to modern times, we lament to find so many instances of suicide among the most polished nations, who have the best opportunities of knowing the atrocity of that unnatural crime. The English have long been reproached by foreigners for the frequent commission of it; and the "gloomy month of November" has been stigmatized as the season when it is most common. But this disgraceful imputation, we think, may be justly attributed, not to the greater frequency of the crime in England than in other places, but to the custom of publishing in the newspapers every instance of suicide which is known. Mr Moore, who lately published a full inquiry into this subject, was at great pains to obtain accurate information concerning the perpetration of this crime in different countries. Mercier, who wrote in 1782, says, that the annual number of suicides in Paris was then about 150. He does not tell us how he came by the information; but we have the authority of the Abbe Fontana for asserting, that more persons put an end to their lives in Paris than in London. The Abbe had this information from the lieutenant of the police. Mr Moore was informed by one of the principal magistrates of Geneva, that in that city, which contains about 25,000 inhabitants, the average number of suicides is about *eight*. The average number of suicides, from what cause soever, for the last 28 years, has been 32 each year for London, Southwark, and Westminster. In Edinburgh, which contains 80,000 inhabitants, we are convinced the average number of suicides does not exceed *four*. Mr Moore found, from the accounts with which he was favoured by the several coroners of the county of Kent, that for the last 18 years the number has been upwards of 32 each year. Kent is supposed to contain 200,000 inhabitants, and London 800,000. It is easy therefore to see, that in the metropolis many instances of suicide must occur which are never the subject of legal inquiry, and consequently never made known to the world. Whereas in the country towns and villages of Kent it is scarcely possible to conceal such an action as self-murder from the knowledge of the whole neighbourhood. The calculation therefore respecting Kent we may receive as true, while we must increase the average number in London very considerably. Mr Moore computes the average number of suicides in England every year at a thousand; but the principles on which he founds this opinion are so imperfect and vague, that we do not think it can be depended on as coming near the truth.

Mercier's Tableau de Paris.

10 The number of suicides in Paris, London, Geneva, &c. according to the best accounts.

11 In what rank and situation suicide is most common.

It might lead to some interesting conclusions to compare together, not only the number of suicides in different countries, but also the rank and principles, the sex and age, of those unhappy persons by whom it has been committed. Mercier says, that at Paris it was the lower ranks who were most commonly guilty of it; that it was mostly committed in garrets or hired lodgings; and that it proceeded from poverty and oppression. A great many, he says, wrote letters to the magistrates before their death. Mr Moore's correspondent from Geneva informed him, that from the year 1777 to 1787 more than 100 suicides were committed in Geneva; that two-thirds of these unfortunate persons were men; that few of the clerical order have been known to commit it; and that it is not so much the end of an immoral, irreligious, dissipated life, as the effect of melancholy and poverty. By the information obtained from the coroners of Kent, it appears, that of the 32, three-fourths have destroyed themselves by hanging; that the proportion of males to females has been about two-thirds of the former; that no one season of the year is more distinguished for this crime than another; and that suicide is upon the increase. Our accounts respecting the city of London are very imperfect; but we think ourselves intitled to conclude, that suicide is more common among the great and wealthy

Moore's Full Inquiry into the Causes of Suicide.

Suicide.

wealthy than among the lower ranks, and that it is usually the effect of gaming and diſſipation.

12 Phyſical cauſes to which it has been aſcribed in Britain.

Thoſe who have inquired into the cauſes of ſuicide in Britain have enumerated many phyſical as well as moral cauſes. They have aſcribed it to the variableneſs of our climate, to the great uſe of animal food, to ſtrong ſpirituous liquors, to tea, and to the ſulphureous exhalations of the pit coal uſed as fuel, which are ſaid to produce a depreſſion of ſpirits and nervous affections. Of our climate, we have no cauſe to complain, nor have we any reaſon to impute any of our vices to its influence. There are many climates much more unfavourable where ſuicide is ſcarcely known. That an exceſſive quantity of groſs animal food, or of ſtrong liquors, or of tea, will powerfully affect the human conſtitution, we will not deny: but before we conſider theſe as cauſes, it muſt firſt be determined, whether thoſe who are guilty of ſelf-murder be much addicted to them; and if they are, whether there be not other cauſes much more violent in their nature which have operated on their mind; for we ought not raſhly to attribute vicious effects to any of thoſe things which ſeem to have been created on purpoſe for the comfort or convenience of man. We are rather ſurpriſed to find that coal is mentioned even as a diſtant cauſe of ſuicide; for it is one of the bleſſings of our iſland; and a good coal fire we have always found rather conducive to good ſpirits than injurious to them.

13 And moral cauſes.

Among the moral cauſes which are ſuppoſed to co-operate in producing ſuicide in Britain, the freedom of our conſtitution and laws is reckoned one. That rational liberty ſhould have any tendency to encourage crimes of any kind, a Chriſtian philoſopher can never allow; for ſuch an opinion is totally diſcountenanced by enlightened views of nature. Mercier has aſcribed the frequency of ſuicide in Paris to the oppreſſion of the late government. Now it appears ſomewhat extraordinary, that ſuicide in one country ſhould be occaſioned by liberty, and in another by the want of it. One of theſe opinions muſt be falſe, and it is ſurely not difficult to diſtinguiſh which.

14 Not owing always to inſanity;

Humanity would in moſt caſes diſpoſe us to conclude, that ſuicide is the effect of inſanity, were there not ſo many inſtances of cool deliberate ſelf-murder. That ſuicide is an unnatural crime, which none but a madman would commit, compaſſion indeed may ſuppoſe; but the murder of a wife, a father, or a child, are alſo unnatural; yet compaſſion does not teach us in all caſes to aſcribe ſuch a crime to madneſs. Paſſion may often ariſe to ſuch a height of outrage as to be ſcarcely diſtinguiſhable from madneſs in its ſymptoms and its effects; yet we always make a diſtinction between that madneſs which ariſes from diſeaſe and that which is owing to a violent peturbation of mind. If a perſon be capable of managing his wordly affairs, of making a will, and of diſpoſing of his property, immediately before his death, or after he formed the reſolution of dying by his own hands, ſuch a man is not to be conſidered as inſane.

15 but often alſo to vicious paſſion.

But though a regard for truth prevents us from aſcribing ſuicide in all caſes to inſanity, we muſt aſcribe it either to inſanity or to vicious paſſion. Theſe two diviſions, we imagine, will comprehend every ſpecies of it, whether ariſing from melancholy, *tædium vitæ* or *ennui*, diſappointment in ſchemes of ambition or love, pride, gaming, or a deſire to avoid the ſhame of a public execution; paſſions which are often increaſed by falſe views of God, of man, and of a future ſtate, ariſing from deiſm and infidelity. If theſe be the cauſes of ſuicide in modern time, what a diſgraceful contraſt do they form to thoſe principles which actuated many of the ancient philoſophers, the Gentoos, the Japaneſe, and the worſhippers of Odin? When they committed ſuicide, they committed it from principle, from a belief of its lawfulneſs, and the hope of being rewarded for what they judged an honourable ſacrifice. But in modern times, we are ſorry to ſay, when it is not the effect of madneſs, it is the effect of vice: and when it is the effect of vice, it proves that the vicious paſſions are then indulged to the higheſt degree; for there is no crime which a man can commit that is ſo ſtrong a ſymptom of the violence of particular paſſions. It is from not attending to this circumſtance, that it has been found ſo difficult to refute the arguments in favour of ſuicide. If the criminality of ſuicide be confined merely to the violent action, many apologies may be made for it; but if it be conſidered ſolely as the effect of vice, as the ſtrongeſt ſymptom of ungoverned paſſion, he who undertakes its defence muſt undertake the defence of what all men will loudly condemn (A).

(A) Several of the heathens entertained a very juſt ſenſe of the atrocity of ſuicide. Quintus Curtius introduces Darius with the following ſpeech, when he had loſt his empire: "I wait (ſays the unfortunate monarch) the iſſue of my fate: you wonder, perhaps, that I do not terminate my own life; but I chooſe rather to die by the crime of another than by my own.

We cannot refuſe ourſelves the pleaſure of preſenting to our readers the following beautiful paſſage upon this ſubject from Fitzoſborne's letters *: I am perſuaded (ſays this elegant writer) this diſguſt of life is frequently indulged out of a principle of mere vanity. It is eſteemed as a mark of uncommon refinement, and as placing a man above the ordinary level of his ſpecies, to ſeem ſuperior to the vulgar feelings of happineſs. True good ſenſe, however, moſt certainly conſiſts not in deſpiſing, but in managing our ſtock of life to the beſt advantage, as a cheerful acquieſcence in the meaſures of Providence is one of the ſtrongeſt ſymptoms of a well conſtituted mind. Self-weariness is a circumſtance that ever attends folly; and to condemn our being is the greateſt, and indeed the peculiar infirmity, of human nature. It is a noble ſentiment which Tully puts into the mouth of Cato, in his Treatiſe upon old Age; *Non lubet mihi* (ſays that venerable Roman) *deplorare vitam, quod multi, et ii docti, ſæpe fecerunt; neque me vixiſſe pœnitet: quoniam ita vixi, ut non fruſtra me natum exiſtimem.*

* Letter iv.

"It is in the power, indeed, of but a very ſmall portion of mankind to act the ſame glorious part that afforded ſuch high ſatisfaction to this diſtinguiſhed patriot; but the number is yet far more inconſiderable of thoſe who cannot, in any ſtation, ſecure themſelves a ſufficient fund of complacency to render life juſtly valuable. Who is it that is placed out of the reach of the higheſt of all gratifications, thoſe of the generous affections, and that cannot provide for

Suicide.

16 Unnecessary to enter into the arguments of casuists upon this subject.

It is unnecessary then to enter particularly into the arguments of those casuists who have undertaken the despicable office of advocates for the crime of suicide. Their talents might surely have been employed more usefully to the world, and more honourably to themselves, than in pleading for a crime, which, if it were committed by every man to whom their principles would make it lawful, would totally destroy some of the noblest virtues, fortitude, patience, and resignation; nay, would destroy society itself, and teach us to despise the opinion that this world is a state of preparation for another. "I came into life without my own consent, and may I not quit it at pleasure?" (say the advocates for suicide). If, because we came into life without our own consent, we might quit it at pleasure, why may we not spend our life also as we please? Why may we not rob and murder, and commit every kind of crime, if *mere inclination* is to be the rule of action! Thus upon the principles of suicide the highwayman and murderer may reason, and every man may find a sufficient apology for any crime which he is tempted to commit. Or this absurdity may be otherwise answered: As we came into life without our own consent, we must have come with the consent of some other being; and logic says, that with the consent of that Being only can we lawfully quit it.

17 Its great criminality and imprudence.

It is sufficient shortly to say, that suicide is contrary to the strongest principle of the human constitution, self-preservation; that it is rebellion against God; that it is cruelty to the feelings and reputation, and often takes away the subsistence of a wife, a child, or a father; that it proves a want of fortitude to brave misfortunes; that it delivers only from imagined to plunge into real evils. We may add, that almost every instance of suicide of which we have heard was rash, imprudent, and premature, interrupted a useful life, or prevented a more honourable death. Had Cato's pride permitted him to yield himself to the generosity of Cæsar, his character and his influence might have contributed to retard the slavery of his country, which his death tended to hasten. Had Brutus and Cassius not executed the fatal resolution which they had formed, of dying by their own hands in case of misfortune, the battle of Philippi might have had a very different issue. Had Hannibal surrendered himself to the Romans, instead of swallowing poison, he would have gained more glory in braving their tortures than he won in the battle of Cannæ; for to die innocently and heroically is the greatest exertion of human fortitude.

As suicide was deemed a crime by the most illustrious and virtuous of the Greek and Roman philosophers, it was considered as a crime by the laws, and treated with ignominy. By the law of Thebes suicides were to have no honours paid to their memory *. The Athenian law ordained the hand which committed the deed to be cut off, and burned apart from the rest of the body. The body was not buried with the usual solemnities, but was ignominiously thrown into some pit. In Cea and Massilia (the ancient *Marseilles*), it was considered as a crime against the state; and it was therefore necessary for those who wished to destroy themselves to obtain permission from the magistrates. † Plutarch acquaints us, that an unaccountable passion for suicide seized the Milesian virgins; from indulging which they could not be prevented by the tears and entreaties of parents and friends: but what persuasion and entreaty could not effect was accomplished by very different means. A decree was issued, "that the body of every young woman who hanged herself should be dragged naked through the streets by the same rope with which she had committed the deed." This wise edict put a complete stop to the extraordinary frenzy, and suicide was no longer committed by the virgins of Miletus.

Suicide.

18 How punished by the Greeks, Ceans, &c.

* *Petite Comment. in Leges Atticas*, p. 523.

† *Plutarch on the Virtues of Women.*

19 By the Romans.

In the early part of the Roman history there seems to have been seldom occasion for framing any laws against suicide. The only instance recorded occurs in the reign of Tarquinius Priscus. The soldiers who were appointed to make drains and common sewers, thinking themselves disgraced by such servile offices, put themselves to death in great numbers. The king ordered the bodies of all the self-murderers to be exposed on crosses, and this put an effectual stop to the practice. It is doubtful whether there was any standing law against suicide during the existence of the republic; but during the reign of the emperors it was thought proper to lay it under certain regulations, though not absolutely to condemn it as a crime. In Justinian's Digests there is a law, by which it was enacted, "that if persons accused, or who had been found guilty, of any crime should make away with themselves, their effects should be confiscated." But this punishment only took place when confiscation of goods happened to be the penalty appointed by the law for the crime of which the self-murderer was accused or found guilty, and was not inflicted for suicide committed in any other circumstances.

Lib. xlviii. Tit. xxi. par. 3.

20 And by Christians.

When the Christian church had extended its jurisdiction in the Roman empire, it was decreed in the sixth century, that no commemoration should be made in the eucharist for such as destroyed themselves: neither should their

---

for his own happiness, by contributing something to the welfare of others? As this disease of the mind generally breaks out with the most violence in those who are supposed to be endowed with a greater delicacy of taste and reason than is the usual allotment of their fellow creatures, one may ask them, whether there is any satiety in the pursuits of useful knowledge? or, if one can ever be weary of benefiting mankind? Will not the fine arts supply a lasting feast to the mind? or, can there be wanting a pleasurable enjoyment, so long as there remains even one advantageous truth to be discovered or confirmed? To complain that life has no joys, while there is a single creature whom we can relieve by our bounty, assist by our counsels, or enliven by our presence, is to lament the loss of that which we possess, and is just as rational as to die for thirst with the cup in our hands. But the misfortune is, when a man is settled into a habit of receiving all his pleasures from the mere selfish indulgences, he wears out of his mind the relish of every nobler enjoyment, at the same time that his powers of the sensual kind are growing more languid by each repetition. It is no wonder, therefore, he should fill up the measure of his gratifications long before he has completed the circle of his duration; and either wretchedly sit down the remainder of his days in discontent, or rashly throw them up in despair."

Suicide || Suit.

their bodies be carried out to burial with pſalms, nor have the uſual ſervice ſaid over them. This eccleſiaſtical law continued till the reformation, when it was admitted into the ſtatute code of England by the authority of parliament. As an additional puniſhment, however, confiſcation of land and goods ſeems to have been adopted from the Danes, as we learn from Bracton ‡. At preſent the puniſhment conſiſts in confiſcating all the perſonal property of a *felo de ſe* for the uſe of the crown, and in excluding his body from interment in conſecrated ground. The warrant of the coroner requires that the body ſhould be buried in ſome public highway, and a ſtake driven through it to increaſe the ignominy.

‡ *De Legibus et Conſuetudinibus Angliæ*, Lib. iii. Tract. 11.

21 Difficult to deviſe a puniſhment that would be an effectual preventive.

To inquire into the prevalence and cauſes of crimes, in order to diſcover the moſt judicious methods of preventing them, is the duty of the Patriot and the Chriſtian. Suicide, we find, is a common and an increaſing evil: but it is a difficult matter to find an effectual remedy; for what motives can be held out ſufficient to influence that man's mind who is deaf to the voice of nature ſpeaking within him, and to the voice of nature's God declaring that he is ſtationed at a poſt which it is his duty to maintain? His reputation and property are indeed within the reach of the laws, his body may be treated with ignominy, and his property confiſcated; but this puniſhment will not be a preventive, even if it could be always inflicted; and that it is ſeldom inflicted, though the laws have decreed it, is well known. The humanity of the preſent age diſpoſes us to ſympathiſe with the relations of the deceaſed, inſtead of demanding that the ſentence of the law ſhould be executed. It is a generally received opinion, and a juſt one, that puniſhments decreed by human laws ſhould be directed only againſt ſuch crimes as are injurious to ſociety; but when it is hence inferred, that ſuicide ought not to be ſubject to the cognizance of human laws, every rule of logic is violated. There is no man, however mean in ſtation and in talents, whoſe life may not, on ſome occaſions, be uſeful to the community at large; and to conclude, that a perſon who fancies himſelf uſeleſs may therefore lawfully put a period to his life, is as falſe reaſoning as it would be to conclude, that by killing a poor man, who lives on the public, we ſhould perform an action not only innocent but meritorious, as we ſhould thereby free ſociety from one of its burdens.

SUIDAS, a Greek writer, according to ſome, flouriſhed in the 11th century, under the reign of the emperor Alexius Comnenus; according to others, before the 10th century. He wrote in Greek an Hiſtorical and Geographical Dictionary or Lexicon; a work which, though not always ſtrictly accurate, is nevertheleſs of great importance, as it contains many things taken from the ancients that are nowhere elſe to be found. The beſt edition of Suidas is that of Kuiſter, in Greek and Latin, with notes, printed in 3 vols. fol. which has been much improved by Toup.

LAPIS SUILLUS. See *Swine-STONE*, MINERALOGY *Index*.

SUIT, is uſed in different ſenſes; as, 1. Suit of court, or ſuit-ſervice, which is an attendance the tenant owes to his lord's court. 2. Suit-covenant, where a perſon has covenanted to do ſervice in the court of the lord. 3. Suit-cuſtom, which is where one and his anceſtors have owed ſuit time out of mind. 4. It is uſed for a petition to the king or any perſon of dignity, where a lord diſtrains his tenant for ſuit, and none is due. In this caſe, the party may have an attachment againſt him to appear in the king's court.

Suit.

SUIT, in *Law*, the ſame with action. The Romans introduced pretty early ſet forms for actions and ſuits into their law, after the example of the Greeks; and made it a rule, that each injury ſhould be redreſſed by its proper remedy only. "*Actiones*, (ſay the Pandects) *compoſitæ ſunt quibus inter ſe homines diſceptarent, quas actiones ne populus prout vellet inſtitueret, certas ſolemneſque eſſe voluerunt.*" The forms of theſe actions were originally preſerved in the books of the pontifical college as choice and ineſtimable ſecrets, till one Cneius Flavius, the ſecretary of Appius Claudius, ſtole a copy and publiſhed them to the people. The concealment was ridiculous: but the eſtabliſhment of ſome ſtandard was undoubtedly neceſſary to fix the true ſtate of a queſtion of right; leſt, in a long and arbitrary proceſs, it might be ſhifted continually, and be at length no longer diſcernible. Or, as Cicero expreſſes it, "*ſunt jura, ſunt formulæ, de omnibus rebus conſtitutæ, ne quis aut in genere injuriæ, aut in ratione actionis, errare poſſit. Expreſſæ enim ſunt ex uniuſcujuſque damno, dolore, incommodo, calamitate, injuria, publicæ à pretore formulæ, ad quas privata lis accommodatur.*" And in the ſame manner Bracton, ſpeaking of the original writs upon which all our actions are founded, declares them to be fixed and immutable, unleſs by authority of parliament. And all the modern legiſlators of Europe have found it expedient, from the ſame reaſons, to fall into the ſame or a ſimilar method. In England, the ſeveral ſuits, or remedial inſtruments of juſtice, are, from the ſubject of them, diſtinguiſhed into three kinds; actions *perſonal*, *real*, and *mixed*.

Blackſt. Comment.

Perſonal actions are ſuch whereby a man claims a debt, or perſonal duty or damages, in lieu thereof; and likewiſe whereby a man claims a ſatisfaction in damages for ſome injury done to his perſon or property. The former are ſaid to be founded upon contracts, the latter upon *torts* or wrongs: and they are the ſame which the civil law calls "*actiones in perſonam, quæ adverſus eum intenduntur qui ex contractu vel delicto obligatus eſt aliquid dare vel concedere.*" Of the former nature are all actions upon debt or promiſes; of the latter are all actions of treſpaſſes, nuiſances, aſſaults, defamatory words, and the like.

Real actions (or, as they are called in the Mirror, *feodal actions*), which concern real property only, are ſuch whereby the plaintiff, here called the *demandant*, claims title to have any lands or tenements, rents, commons, or other hereditaments, in fee-ſimple, fee-tail, or for term of life. By theſe actions formerly all diſputes concerning real eſtates were decided; but they are now pretty generally laid aſide in practice, upon account of the great nicety required in their management, and the inconvenient length of their proceſs; a much more expeditious method of trying titles being ſince introduced, by other actions perſonal and mixed.

Mixed actions are ſuits partaking of the mixture of the other two, wherein ſome real property is demanded, and alſo perſonal damages for a wrong ſuſtained. As for inſtance, an action of waſte: which is brought by him who hath the inheritance, in remainder or reverſion, againſt the tenant for life, who hath committed waſte therein,

therein, to recover not only the land wasted, which would make it merely a real action; but also treble damages, in pursuance of the statute of Gloucester, which is a personal recompence; and so both, being joined together, denominate it a *mixed action*.

The orderly parts of a suit are these: 1. The original *writ*. 2. The *process*. 3. The *pleadings*. 4. The *issue* or demurrer. 5. The *trial*. 6. The *judgement* and its incidents. 7. The proceedings in nature of *appeals*. 8. The *execution*. See these articles.

SULLY. See BETHUNE.

SULPHATE, in *Chemistry*, denotes a compound of sulphuric acid with some base.

SULPHUR, a well known inflammable substance. See CHEMISTRY and MINERALOGY *Index*.

SULPHUR-Wort. See PEUCEDANUM, BOTANY *Index*.

SULPHURIC ACID, the name now adopted for the vitriolic acid. See CHEMISTRY *Index*.

SULPICIA, an ancient Roman poetess, who lived under the reign of Domitian, and has been so much admired as to be termed the *Roman Sappho*. We have nothing, however, left of her writings but a satire, or rather the fragment of one, against Domitian, who published a decree for the banishment of philosophers from Rome; which satire is to be found in Scaliger's *Appendix Virgiliana*. She is mentioned by Martial and Sidonius Apollinaris; and is said to have addressed a poem on conjugal love to her husband Calenus, a Roman knight.

SULPICIUS SEVERUS, an ecclesiastical writer who flourished about the beginning of the 5th century, and was contemporary with Rufinus and St Jerome. He was the disciple of St Martin of Tours, whose life he has written; and the friend of Paulinus bishop of Nola, with whom he held an intimate correspondence. The principal of his works is his *Historia Sacra*, from the creation of the world to the consulate of Stilicho and Aurelian, about the year 400; in which his style is elegant beyond the age he lived in.

SULTAN, or SOLDAN, a title of appellation given to the emperor of the Turks.

Vattier will have the word Turkish, and to signify *king of kings*; adding, that it was first given to the Turkish princes Angrolipex and Masgud, about the year 1055: others will have it originally Persian, alleging, in proof hereof, an ancient medal of Cosroe; others derive it from *soldanus*, *quasi solus dominus*; others from the Hebrew שלט, *schalat* or *sheleth*, "to rule, reign."

It had its rise under Mahmoud, son of Sebectegin, the first emperor of the dynasty of the Gaznevides, towards the close of the fourth century of the era of the Hegira: when that prince going to Segestan to reduce Kalaf governor of that province, who affected the sovereignty, Kalaf was no sooner advertised of his coming than he went out to meet him, delivered the keys of his fortress, and owned him his *sultan*, that is, his lord or commander. The title pleased Mahmoud so well, that he assumed it ever afterwards; and from him it passed to his descendants, and to other Mahometan princes. It is chiefly confined to the Turkish and Persian monarchs.

SULZER, M. a celebrated philosopher, was born at Winterthur, in the canton of Zurich, October 16. 1720. He was the youngest of 25 children. His early education did not promise much, though it was by no means neglected. He had little inclination for what is called in the schools the study of *humanity*, and made but a small progress in the learned languages, which were to prepare him for the study of theology, for which profession his parents designed him. At the age of 16, when he went to the academical school of Zurich, he had not the smallest notion of the sciences, or of elegant literature, and consequently no taste for study. The first incident that developed a hidden germ of philosophical genius, was his meeting with Wolfe's Metaphysics: this was the birth of his taste for science; but he wanted a guide. The clergyman with whom he lodged was an ignorant man; and the academical prelections were, as yet, above the reach of his comprehension. On the other hand, a sedentary life was not the thing he liked, nor to which he had been accustomed; and, moreover, a sociable turn of mind led him often into company, where he lost much time in frivolous amusements, yet without corrupting his morals. Who, that observed him at this period, says Mr Formey in his *Eulogium*, would have thought that Sulzer would one day be numbered among the most knowing and wise men of his time? The learned Gesner was the instrument of Providence that rendered Sulzer's inclination to study triumphant over his passion for amusement and company. Animated by the counsels and example of this worthy and learned man, he applied himself to philosophy and mathematics with great ardour, and resumed the pursuit of Grecian literature and the Oriental languages. The contemplation of nature became his noble and favourite passion. An ecclesiastical settlement in a rural scene, that exhibited happy objects and occasions for this delightful study, began to render his days happy and useful; and he published, in 1741, Moral Contemplations of the Works of Nature; and the year following an Account of a Journey he had made through the Alps; which showed, at the same time, his knowledge of natural history and the taste and sensibility with which he surveyed the beauties of nature, and the grandeur and goodness of its Author. He afterwards became private tutor to a young gentleman at Magdeburg. This procured him the acquaintance of Messrs Maupertuis, Euler, and Sack, which opened to his merit the path of preferment, and advanced him successively to the place of mathematical professor in the King's College at Berlin, in 1747, and to that of member of the Royal Academy in 1750.

In this last quality he distinguished himself in a very eminent manner, enriched the class of speculative philosophy with a great number of excellent memoirs, and was justly considered as one of the first-rate metaphysicians in Germany. But his genius was not confined to this branch of science. His Universal Theory of the Fine Arts is a valuable production. A profound knowledge of the arts and sciences, and a perfect acquaintance with true taste, are eminently displayed in this work, and will secure to its author a permanent and distinguished rank in the republic of letters. The first volume of this excellent work was published in 1771, and the second in 1774. We shall not here give a catalogue of the writings of M. Sulzer; but we cannot help mentioning his Remarks on the Philosophical Essays of the late Mr Hume as a work of real merit, which does justice to the acuteness, while it often detects the sophistry, of the British Bayle. The moral character of M. Sulzer was amiable and virtuous: sociability and benefi-

Sulzer || Sumatra.

cence were its characteristical lines; and his virtues were animated by that sacred philosophy that forms the Christian, ennobles man, and is the only source of that heart-felt serenity and sedate fortitude which support humanity, when every other object of confidence fails. His dying moments were calm, humble, and sublime; and when he expired, the placid and composed air of his countenance made his mourning friends doubt, for some time, whether it was death or sleep that had suspended his conversation. He had no enemy; and his friends were numerous, affectionate, and worthy of the tender returns he made them.

The king of Prussia distinguished him by repeated marks of munificence and favour. But his royal protector had never seen him before the end of the year 1777, though he had been member of the academy from the year 1750. The audience, indeed, though late vouchsafed, was honourable to M. Sulzer, with whom the monarch conversed for a long time with great condescension.

SUM, signifies the quantity that arises from the addition of two or more magnitudes, numbers, or quantities together.

SUMACH. See RHUS, BOTANY *Index*.

SUMATRA, an island of Asia, the most western of the Sunda islands, and constituting on that side the boundary of the Eastern Archipelago. Its general direction is nearly north west and south east. The equator divides it into almost equal parts, the one extremity being in 5. 53. N. and the other in 5. 56. S. Lat. Acheen Head, at the north extremity of the island, is in longitude 95. 34. east. It lies exposed on the south-west side to the Indian ocean; the north point stretches into the bay of Bengal; to the north east it is divided from the peninsula of Malacca by the straits of that name; to the east by the straits of Banca, from the island of that name; to the south-east by the commencement of what are called the *Chinese seas*; and on the south by the straits of Sunda, which separate it from the island of Java. It is about 900 miles in length, but from 100 to 150 only in breadth. No account had been given of this island by any Englishman till the year 1778, when Mr Charles Miller (son of the late botanical gardener) published an account of the manners of a particular district, in the 68th volume of the Philosophical Transactions. These were the Battas, a people who live in the interior parts, called the *Cassia Country*. They differ from all the other inhabitants in language, manners, and customs. They eat the prisoners whom they take in war, and hang up their skulls as trophies in their houses. He observes, however, that human flesh is eaten by them *in terrorem*, and not as common food, though they prefer it to all others, and speak with peculiar raptures of the soles of the feet and palms of the hands. They expressed much surprise that the white people did not kill, much less eat, their prisoners. From this country the greatest part of the cassia that is sent to Europe is procured. It abounds also with the camphire trees, which constitute the common timber in use; and in these trees the camphire is found native, in a concrete form. It is remarkable that, in this state it is sold to the Chinese at the price of 250l. or 300l. per cent. but these dexterous artists contrive to furnish the Europeans with it at about a quarter of that price. In 1783, Mr Marsden, who had been secretary to the president and council of Fort Marlborough, published a History of Sumatra, with very copious particulars of the island. He represented it as surpassed by few in the beautiful indulgences of nature. A chain of high mountains runs through its whole extent; the ranges in many parts being double and treble; their altitude, though great, is not sufficient to occasion their being covered with snow during any part of the year. Between these ridges are extensive plains, considerably elevated above the surface of the maritime lands. In these the air is cool; and from this advantage they are esteemed the most eligible portion of the country, are the best inhabited, and the most cleared from woods, which elsewhere, in general, throughout Sumatra, cover both hills and valleys with an eternal shade. Here too are found many large and beautiful lakes, that facilitate much the communication between the different parts. The heat of the air is far from being so intense as might be expected from a country occupying the middle of the torrid zone; and it is more temperate than many regions within the tropics; the thermometer at the most sultry hour, about two in the afternoon, generally fluctuating between 82 and 85 degrees. Mr Marsden divides the inhabitants into Malays, Achenese, Battas, Lampoons, and Rejangs; and he takes the latter as his standard of description, with respect to the persons, manners, and customs, of the inhabitants. They are rather below the middle stature; their bulk in proportion; their limbs for the most part slight, but well shaped, and particularly small at the wrists and ancles; and, upon the whole, they are gracefully formed. Their hair is strong, and of a shining black. The men are beardless, great pains being taken to render them so when boys, by rubbing their chins with a kind of quicklime. Their complexion is properly yellow, wanting the red tinge that constitutes a copper or tawny colour. They are in general lighter than the Mestees, or half-breed, of the rest of India; those of the superior class, who are not exposed to the rays of the sun, and particularly their women of rank, approaching to a degree of fairness. If beauty consisted in this one quality, some of them would surpass our brunettes in Europe. The major part of the females are ugly, many of them even to disgust; yet among them are some whose appearance is strikingly beautiful, whatever composition of person, features, and complexion, that sentiment may be the result of. Some of the inhabitants of the hilly parts are observed to have the swelled neck or goitre; but they attempt no remedy for it, as these wens are consistent with the highest health. The rites of marriage among the Sumatrans consist simply in joining the hands of the parties, and pronouncing them man and wife without much ceremony, excepting the entertainment which is given upon the occasion by the father of the girl. The customs of the Sumatrans permit their having as many wives as they can purchase, or afford to maintain; but it is extremely rare that an instance occurs of their having more than one, and that only among a few of the chiefs. This continence they owe, in some measure, to their poverty. The dictates of frugality are more powerful with them than the irregular calls of appetite, and make them decline an indulgence from which their law does not restrain them. Mothers carry their children, not on the arm as our nurses do, but straddling on the hip, and usually supported by a cloth which ties in a knot on the opposite shoulder. The children are nursed but little; are not confined

Brooke's Gazetteer.

Sumatra.

Sumatra.

confined by any ſwathing or bandages; and being ſuffered to roll about the floor, ſoon learn to walk and ſhift for themſelves. When cradles are uſed, they ſwing ſuſpended from the ceilings of the rooms.

The Sumatrans are ſo fond of cock-fighting, that a father on his death-bed has been known to deſire his ſon to take the firſt opportunity of matching a cock for a ſum equal to his whole property, under a blind conviction of its being invulnerable. When a cock is killed or runs, the other muſt have ſufficient ſpirit and vigour left to peck at him three times on his being held up to him for that purpoſe, or it becomes a drawn battle; and ſometimes an experienced cocker will place the head of his vanquiſhed bird in ſuch an uncouth ſituation as to terrify the other, and render him unable to give this proof of victory.

The wild beaſts of Sumatra are tigers, elephants, rhinoceroſes, bears, and monkeys. The tigers prove to the inhabitants both in their journeys and even their domeſtic occupations moſt deſtructive enemies. The number of people annually ſlain by theſe rapacious tyrants of the woods is almoſt incredible. Whole villages have been depopulated by them; yet from a ſuperſtitious prejudice, it is with difficulty they are prevailed upon, by a large reward which the India Company offers, to uſe methods of deſtroying them, till they have ſuſtained ſome particular injury in their own family or kindred. The ſize and ſtrength of the ſpecies which prevails on this iſland is prodigious. They are ſaid to break with a ſtroke of their fore paw the leg of a horſe or a buffalo; and the largeſt prey they kill is without difficulty dragged by them into the woods. This they uſually perform on the ſecond night, being ſuppoſed on the firſt to gratify themſelves with ſucking the blood only. Time is by this delay afforded to prepare for their deſtruction, either by ſhooting them, or placing a veſſel of water ſtrongly impregnated with arſenic near the carcaſe, which is faſtened to a tree to prevent its being carried off. The tiger having ſatiated himſelf with the fleſh, is prompted to aſſuage his thirſt with the tempting liquor at hand, and periſhes in the indulgence. Their chief ſubſiſtence is moſt probably the unfortunate monkeys with which the woods abound. They are deſcribed as alluring them to their fate by a faſcinating power, ſimilar to what has been ſuppoſed of the ſnake; and, ſays Mr Marſden, "I am not incredulous enough to treat the idea with contempt, having myſelf obſerved, that when an alligator or a crocodile, in a river, comes under an overhanging branch of a tree, the monkeys, in a ſtate of alarm and diſtraction, crowd to the extremity, and, chattering and trembling, approach nearer and nearer to the amphibious monſter that waits to devour them as they drop, which their fright and number render almoſt unavoidable." Theſe alligators likewiſe occaſion the loſs of many inhabitants, frequently deſtroying the people as they bathe in the river, according to their regular cuſtom, and which the perpetual evidence of the riſk attending it cannot deter them from. A ſuperſtitious idea of their ſanctity alſo preſerves them from moleſtation, although, with a hook of ſufficient ſtrength, they may be taken without much difficulty. The other animals of Sumatra are buffaloes, a ſmall kind of horſes, goats, hogs, deer, bullocks, and hog-deer. This laſt is an animal ſomewhat larger than a rabbit, the head reſembling that of a hog, and its ſhanks and feet like thoſe of the deer. The bezoar-ſtone found on this animal has been valued at 10 times its weight in gold; it is of a dark brown colour, ſmooth on the outſide; and the coat being taken off, it appears ſtill darker, with ſtrings running underneath the coat: it will ſwim on the top of the water. If it be infuſed in any liquid, it makes it extremely bitter: the virtues uſually attributed to this ſtone are cleanſing the ſtomach, creating an appetite, and ſweetening the blood.

Of birds they have a greater variety than of beaſts. The coo-ow, or Sumatran pheaſant, is a bird of uncommon beauty. They have ſtorks of prodigious ſize, parrots, dung-hill fowls, ducks, the largeſt cocks in the world, wood-pigeons, doves, and a great variety of ſmall birds, different from ours, and diſtinguiſhed by the beauty of their colours. Of the reptiles, they have lizards, flying-lizards, and cameleons. The iſland ſwarms with inſects, and their varieties are no leſs extraordinary than their numbers. Rice is the only grain that grows in the country; they have ſugar-canes, beans, peaſe, radiſhes, yams, potatoes, pumkins, and ſeveral kinds of pot-herbs unknown to Europe; and here are to be found moſt of the fruits to be met with in other parts of the Eaſt Indies, in the greateſt perfection. Indigo, Braſil-wood, two ſpecies of the bread-fruit tree, pepper, benjamin, coffee, and cotton, are likewiſe the produce of this iſland, as well as caſſia and camphire mentioned above. Here alſo is the cabbage-tree and ſilk cotton tree; and the foreſts contain a great variety of valuable ſpecies of wood, as ebony, pine, ſandal, eagle or aloes, teek, manchineel, and iron-wood, and alſo the banyan tree. Gold, tin, iron, copper, and lead, are found in the country; and the former is ſuppoſed to be as plentiful here as in Peru or Mexico. The fineſt gold and gold-duſt are found in the country of *Limong*, immediately contiguous to the preſidency of *Fort Marlborough*, to which the merchants repair annually for the purchaſe of opium, and ſuch other articles as they may be in want of, and give for them gold of ſo pure a nature as to contain little or no alloy. The native indolence of the *Malay* diſpoſition prevents them from collecting more than is ſufficient to ſupply the few and ſimple wants of a race of men as yet unenlightened by civilization and ſcience, and ignorant of the full extent of the advantages of the country inhabited by them. The roads leading to this golden country are almoſt impervious; affording only a ſcanty path to a ſingle traveller, where whole nights muſt be paſſed in the open air, expoſed to the malignant influence of a hoſtile climate, in a country infeſted by the moſt ferocious wild beaſts. Theſe are circumſtances that have hitherto checked curioſity; but perſeverance and ſtudied precaution will ſurmount the obſtacles they furniſh, and ſuch diſcoveries might be made as would amply compenſate for the difficulties leading to them. The gold merchants who come from the neighbouring and leſs rich countries, give us ſuch accounts of the facility of procuring gold as border nearly on the marvellous, and would be altogether incredible, if great quantities of that metal produced by them did not in ſome degree evince the certainty of their accounts.

Aſiatic Reſearches, vol. i.

This great abundance of gold in Sumatra induces Mr Marſden to ſuppoſe that iſland to be the Ophir of Solomon; a conjecture which, in his opinion, derives no ſmall force from the word *Ophir's* being really a *Malay* ſubſtantive, of a compound ſenſe, ſignifying a mountain containing

containing gold. The natives, he confesses, have no oral tradition on the subject; and we have elsewhere made it probable, that Ophir was situated in a different quarter of the world (see OPHIR). Besides the metals and different species of wood which we have mentioned, Sumatra produces sulphur, arsenic, saltpetre, and beeswax, with edible birds-nests, which are there commodities of great importance (see *BIRDS-Nests*).

The English and Dutch have factories on this island; the principal one of the former being Fort Marlborough, on the south-west coast. The original natives of Sumatra are Pagans; but it is to be observed, that when the Sumatrans, or any of the natives of the eastern islands, learn to read the Arabic character, and submit to circumcision, they are said to become Malays; the term *Malay* being understood to mean *Mussulman*. See ACHEEN.

SUMMARY, in matters of literature. See ABRIDGEMENT.

SUMMER, the name of one of the seasons of the year, being one of the quarters when the year is divided into four quarters, or one half when the year is divided only into two, summer and winter. In the former case, summer is the quarter during which, in northern climates, the sun is passing through the three signs Cancer, Leo, Virgo, or from the time of the greatest declination, till the sun come to the equinoctial again, or have no declination; which is from about the 21st of June till about the 22d of September. In the latter case, summer contains the six warmer months, while the sun is on one side of the equinoctial; and winter the other six months, when the sun is on the other side of it. It is said that a frosty winter produces a dry summer, and a mild winter a wet summer.

SUMMER-Islands. See BERMUDAS.

SUMMER Red-Bird. See MUSCICAPA, ORNITHOLOGY *Index*.

SUMMIT, the top or vertex of any body or figure, as of a triangle, cone, pyramid, &c.

SUMMONS, in *Law*, a citing or calling a person to any court, to answer a complaint or to give his evidence.

SUMMONS, in *War*. To summon a place, is to send a drum or trumpet to command the governor to surrender, and to declare that if the place be taken by storm, all must submit to the mercy of the conqueror. See CAPITULATION and CHAMADE.

SUMMUM BONUM, in *Ethics*, the chief good.

SUMP, in *Metallurgy*, a round pit of stone, lined with clay within, for receiving the metal on its first fusion from the ore.

SUMP, in the British salt-works, where sea-water is boiled into salt, is the name of a sort of pond, which is made at some distance from the saltern on the sea-shore, between full sea and low water mark. From this pond a pipe is laid, through which, when it is full sea, the water runs into a well adjoining to the saltern; and from this well it is pumped into troughs, through which it is carried to the cisterns, in order to be ready to supply the pans. See SALT.

SUMP, in *Mining*, denotes a pit sunk down in the bottom of the mine, to cut or prove the lode still deeper than before; and in order to slope and dig it away if necessary, and also to drive on the lode in depth. The sump principally serves as a bason or reservoir, to collect the water of a mine together, that it may be cleaned out by an engine or machine.

SUMPTER-HORSE, is a horse that carries provisions and necessaries for a journey.

SUMPTUARY LAWS (*Leges Sumptuariæ*), are laws made to restrain excess in apparel, costly furniture, eating, &c.

Most ages and nations have had their sumptuary laws; and some retain them still, as the Venetians, &c. But it is observed, that no laws are worse executed than sumptuary laws. Political writers have been much divided in opinion with respect to the utility of these laws to a state. Montesquieu observes, that luxury is necessary in monarchies, as in France, but ruinous to democracies, as in Holland. With regard to England, whose government is compounded of both species, it may still be a dubious question, says Judge Blackstone, how far private luxury is a public evil; and as such cognizable by public laws.

The sumptuary laws of the ancient Locrian legislator Zaleucus are famous: by these it was ordained, that no woman should go attended with more than one maid in the street except she were drunk: that she should not go out of the city in the night, unless she went to commit fornication: that she should not wear any gold or embroidered apparel, unless she proposed to be a common strumpet; and that men should not wear rings or tissues except when they went a whoring, &c.

Among the Romans, the sumptuary laws were very numerous: By the *Lex Orchia*, the number of guests at feasts was limited, though without any limitation of the charges: by the Fannian law, made 22 years afterwards, it was enacted, that more than 10 *asses* should not be spent at any ordinary feast: for the solemn feasts, as the Saturnalia, &c. an hundred asses were allowed; ten of which, Gellius informs us, was the price of a sheep, and a hundred of an ox. By the Didian law, which was preferred 18 years after, it was decreed, that the former sumptuary laws should be in force, not only in Rome, but throughout all Italy; and that for every transgression, not only the master of the feast, but all the guests too, should be liable to the penalty.

The English have had their share of sumptuary laws, chiefly made in the reigns of Edward III. Edward IV. and Henry VIII. against shoes with long points, short doublets, and long coats; though all repealed by statute 1 Jac. I. c. 25. As to excess in diet, there remains still one law unrepealed. Under King Henry IV. Camden tells us, pride had got so much into the foot, that it was proclaimed, that no man should wear shoes above six inches broad at the toes. And their other garments were so short, that it was enacted, 25 Edward IV. that no person, under the condition of a lord, should from that time, wear any mantle or gown, unless of such length, that, standing upright, it might cover the lower part of the trunk of his body.

SUN, SOL, ☉, in *Astronomy*, the great luminary which enlightens the world, and by its presence constitutes day. See ASTRONOMY *Index*.

Mock-SUN. See PARHELION.

SUN-Fish, a species of shark. See SQUALUS, ICHTHYOLOGY *Index*.

SUN-Flower. See HELIANTHUS, } BOTANY *Index*.
SUN-Dew. See DROSERA, }

SUNDA-ISLANDS, a general name for a cluster of islands

islands in the Indian ocean, between 93° and 120° of east longitude, and between 8° north and 8° south latitude. The particular names of the islands are *Borneo*, *Sumatra*, *Java*, *Bally*, *Banca*, &c.

SUNDAY, or the LORD'S-DAY, a solemn festival observed by Christians on the first day of every week, in memory of our Saviour's resurrection. See SABBATH.

In the breviary and other offices we meet with Sundays of the first and second class. Those of the first class are, Palm, Easter, Advent, and Whitsunday, those of *Quasimodo* and *Quadragesima*. Those of the second class are the common Sundays. Anciently each Sunday in the year had its particular name, which was taken from the introit of the day; which custom has only been continued to some few in lent; as *Reminiscere*, *Oculi*, *Lætare*, *Judica*.

Some are of opinion that the Lord's day, mentioned in the Apocalypse, is our Sunday; which they believe was so early instituted by the apostles. Be this as it will, it is certain a regard was had to this day even in the earliest ages of the church; as appears from the first apology of Justin Martyr, where he describes the exercise of the day not much unlike to ours.

But it was Constantine the Great who first made a law for the proper observation of Sunday; and who, according to Eusebius, appointed it should be regularly celebrated throughout the Roman empire. Before him, and even in his time, they observed the Jewish Sabbath as well as Sunday; both to satisfy the law of Moses and to imitate the apostles, who used to meet together on the first day.

By Constantine's laws, made in 321, it was decreed, that for the future the Sunday should be kept a day of rest in all cities and towns; but he allowed the country people to follow their work. In 538, the council of Orleans prohibited country labour; but because there were still many Jews in Gaul, and the people fell into many superstitious uses in the celebration of the new Sabbath, like those of the Jews among that of the old, the council declares, that to hold it unlawful to travel with horses, cattle, and carriages, to prepare food, or to do any thing necessary to the cleanliness and decency of houses or persons, savours more of Judaism than of Christianity. See *SABBATH-Breaking*.

SUNDAY-Schools. See *Sunday-SCHOOLS*.

SUOVETAURILIA, an ancient Roman sacrifice, so called because it consisted of a pig (*sus*), a sheep or rather ram (*ovis*), and a bull (*taurus*). They were all males, to denote the masculine courage of the Roman people. It was likewise called *solitaurilia*, because the animals offered up were always *solida*, whole or uncut.

SUPERCARGO, a person employed by merchants to go a voyage, and oversee their cargo or lading, and dispose of it to the best advantage.

SUPERCILIUM, in *Anatomy*, the eye-brow. See ANATOMY, N°. 142.

SUPEREROGATION, in *Theology*, what a man does beyond his duty, or more than he is commanded to do. The Romanists stand up strenuously for works of supererogation, and maintain that the observance of evangelical councils is such. By means hereof, a stock of merit is laid up, which the church has the disposal of, and which she distributes in indulgences to such as need.

This absurd doctrine was first invented towards the close of the 12th century, and modified and embellished by St Thomas in the 13th: according to which, it was pretended that there actually existed an immense treasure of merit, composed of the pious deeds and virtuous actions which the saints had performed beyond what was necessary for their own salvation, and which were therefore applicable to the benefit of others; that the guardian and dispenser of this precious treasure was the Roman pontiff; and that of consequence he was empowered to assign to such as he thought proper a portion of this inexhaustible source of merit, suitable to their respective guilt, and sufficient to deliver them from the punishment due to their crimes.

The reformed churches do not allow of any work of supererogation; but hold with the apostles, that when we have done our best, we are but unprofitable servants.

SUPERFETATION, in *Physiology*, a second or after-conception, happening when the mother, already pregnant, conceives of a latter coition; so that she bears at once two fœtuses of unequal age and bulk, and is delivered of them at different times. We meet with instances of superfetations in Hippocrates, Aristotle, Du Laurens, &c.: but they are said to be much more frequent in hares and swine.

SUPERFICIES, or SURFACE, in *Geometry*, the outside or exterior face of any body. This is considered as having the two dimensions of length and breadth only, but no thickness; and therefore it makes no part of the substance or solid content or matter of the body.

The terms, or bounds, or extremities, of a superficies, are lines; and superficies may be considered as generated by the motions of lines. Superficies are either rectilinear, curvilinear, plane, concave, or convex. A rectilinear superficies is that which is bounded by right lines. Curvilinear superficies is bounded by curve lines. Plane superficies is that which has no inequality in it, nor risings, nor sinkings, but lies evenly and straight throughout, so that a right line may wholly coincide with it in all parts and directions. Convex superficies is that which is curved and rises outwards. Concave superficies is curved and sinks inward. See GEOMETRY.

SUPERFINE, in the manufactories, a term used to express the superlative fineness of a stuff: thus a cloth, a camblet, &c. are said to be superfine when made of the finest wool, &c. or when they are the finest that can be made.

SUPERFLUOUS INTERVAL, in *Music*, is one that exceeds a true diatonic interval by a semitone minor. See INTERVAL.

SUPERINTENDANT, denotes an ecclesiastical superior in several reformed churches where episcopacy is not admitted; particularly among the Lutherans in Germany, and the Calvinists in some other places.

The superintendant is similar to a bishop; only his power is somewhat more restrained than that of our diocesan bishops. He is the chief pastor, and has the direction of all the inferior pastors within his district or diocese. In Germany they had formerly superintendants general, who were superior to the ordinary superintendants. These, in reality, were archbishops; but the dignity is sunk into disuse; and at present none but the superintendant of Wirtemberg assumes the quality of superintendant general.

SUPERIOR, a person raised above another in rank, office, or talents.

SUPERIOR,

Superior || Superstition.

SUPERIOR, in *Scots Law*. See LAW, N° clxiv. 3. clxv. 2. and clxvi.

SUPERLATIVE, in *Grammar*, one of the three degrees of comparison, being that inflection of adjective nouns that serves to augment and heighten their signification, and shows the quality of the thing denoted to be in the highest degree. See GRAMMAR.

SUPERNUMERARY, something over and above a fixed number. In several of the offices are supernumerary clerks, to be ready on extraordinary occasions.

SUPERPARTICULAR PROPORTION, or *Ratio*, is that in which the greater term exceeds the less by unit or 1. As the ratio of 1 to 2, or 2 to 3, or 3 to 4, &c.

SUPERPARTIENT PROPORTION, or *Ratio*, is when the greater term contains the less term once, and leaves some number greater than 1 remaining. As the ratio

of 3 to 5, which is equal to that of 1 to $1\frac{2}{3}$;
of 7 to 10, which is equal to that of 1 to $1\frac{3}{7}$, &c.

SUPERSEDEAS, in *Law*, a writ issued in divers cases, importing in general a command to stay or forbear some ordinary proceedings in law, which in appearance ought to be done or pursued, were it not for the cause whereon this writ is granted.

Thus a man regularly is to have a surety of peace against him of whom he will swear he is afraid; and the justice required hereunto cannot deny it him: yet, if the party be formerly bound to the peace, either in chancery or elsewhere, this writ lies to stay the justice from doing that which otherwise he ought not to deny.

SUPERSTITION, a word that has been used so indefinitely, that it is difficult to determine its precise meaning. From its resemblance in sound to the Latin word *superstes*, "a survivor," it is evidently derived from it, and different attempts have been made to trace their connection in signification. Balbus, in the dialogue *De Natura Deorum* of Cicero, says, that they who prayed and sacrificed whole days that their children might *survive* them, were called superstitious. Lactantius censures this etymology, and says they were not called superstitious who wished that their children might survive them (for this we all wish), but because they who survived their parents worshipped their images. Others again say, that superstition is derived from *superstes*, because it consisted in considering the dead as if they were alive. But these etymologies are solely conjectural; and we consider conjectures as absurd in philology as we do in science; they may mislead, but are seldom of any benefit. The usual meaning affixed to the word *superstition*, both in the Latin and English languages, is so different from *superstes*, that its change of meaning must be owing to some accident which it is in vain to inquire after. If we had not known that the word *paganus* "a pagan" was derived from *pagus* "a village," because the heathens in a certain period of the Christian history lived in villages, the whims and fancies of etymologists would not have thrown much light on the subject.

Without labouring, from the aid of etymology, to define superstition, which is a word of a very extensive signification, we will consider to what objects it is applied; and then, by observing what is common to them all, we shall be enabled to fix with some degree of precision the meaning the term. We apply it to the idolatry of the heathens; we apply it also to the Jews, who made the will of God of no effect by their traditions, and substituted ceremonies in place of the religion of their fathers. We say also that Christians are guilty of superstition; the Roman Catholics, who believe in transubstantiation and in the efficacy of prayers to saints; and those Protestants who esteem baptism and the Lord's supper, and the punctual performance of other ceremonies, without regard to morality, as sufficient to ensure salvation. Those persons are also reckoned superstitious who believe, without any evidence, that prophecies are still uttered by the divine inspiration, and that miracles are still performed. The word is also extended to those who believe in witchcraft, magic, and apparitions, or that the divine will is declared by omens or augury; that the fortune of individuals can be affected by things indifferent, by things deemed lucky or unlucky, or that diseases can be cured by words, charms, and incantations.

Through all the particulars which we have enumerated, there runs one general idea, the belief of what is false and contrary to reason. From this, however, we must not suppose that whatever is false and contrary to reason may be denominated superstition. We think that it is false and irrational to suppose that there ever lived on earth a race of men who walked on one leg, and had their eyes in their breast; or that there were giants 90 feet high: yet we do not call the philosopher who believes these chimeras superstitious, but credulous. Superstition has always a reference to God, to religion, or to beings superior to man. We do not however distinguish all false and irrational opinions in religion by the name of superstition. We do not, for instance, apply this name to the opinions which some of the ancients entertained, that God is the soul of the world, and that men are only portions of him separated for a time, or that the soul after death lives successively in different bodies. If we examine the subject with more attention, we shall discover that the foundation of superstition is ignorance of the moral attributes of God; for we never say a man is superstitious for entertaining erroneous opinions of the natural attributes of God. Some of the Socinians have denied the prescience of God; and a French philosopher has not only rejected the belief that He is a spirit, but has presumed to say that he is composed of a species of crystals. The first of these opinions discovers very imperfect ideas of God, and the second is the height of impiety and absurdity; yet the Socinians have not been accused of superstition, nor can this French philosopher be suspected of it. We do not call every false opinion concerning the unity or moral attributes of God by the name of superstition, as, for instance, the opinion which some sceptics have supported, that God is not good; for, as was mentioned before, superstition always involves the idea of credulity. It does not consist in falsely denying that God possesses any particular moral attributes, but in believing more than what is true concerning them; in forming mean, unworthy ideas of them; in supposing that he is guided by blind passion like mankind, and enjoins upon his creatures commandments which are irrational and absurd.

As superstition arises from ignorance and credulity in the understanding, so it has also a seat in the passions. Fear has been commonly considered as the passion of the human mind from which it chiefly derives its origin;

Superstition.

and there is no doubt that more superstition has arisen from fear united with ignorance and credulity than from any other passion. Yet it would certainly be improper to exclude all other passions. We cannot account for the superstition of the Egyptians, without supposing that much of it arose from gratitude. They worshipped the Nile, because it distributed fertility and abundance over the land of Egypt; and they worshipped some animals, merely because they prevented the increase of other animals which were noxious. Thus they adored the ibis, because it destroyed the eggs of the crocodile.

Having thus endeavoured to analyze the ideas comprehended under the word superstition, we may sum them up in a few words. It respects God and beings superior to man, and extends to our religious opinions, worship, and practices; and may be defined *absurd opinions and actions arising from mean and defective ideas of the moral attributes of God.* Let us apply this definition to the different species of superstition already mentioned.

But before entering upon this application, it may be proper to observe, that superstition involves the idea of a blameable inattention to reason, or a credulity arising from an indolence of understanding. We generally make a distinction between the imperfect opinions which a savage, from the necessary effects of his situation, forms of the attributes of God, and those which civilized nations entertain. We say the savage is ignorant, and we ascribe his ignorance to his situation; but we call the Roman Catholic superstitious, and we blame him for not having those just ideas of God which he might have obtained by opening his Bible, or by the exercise of his understanding in the favourable situation in which he is placed. Superstition then does not originate so much from the natural weakness of the human understanding, as from a misapplication or a neglect of it (A).

We cannot therefore with any propriety apply the name *superstition* to polytheism in general; for what all the ancient philosophers, after much study and reflection, concluded to be true, could never proceed from credulity and inattention, but from their situation. We speak very properly, however, when we call idolatry by the name of superstition; because there is no man so devoid of understanding as not to be capable of discovering, that a piece of metal, or wood, or stone, can neither hear nor answer petitions. *Superstition* was a name which the ancient philosophers gave to those who entertained mean opinions of the gods, or did foolish things to obtain their favour. According to Theophrastus, the superstitious man is one who, having washed his hands, and sprinkled himself all round, leaves the temple with a laurel leaf in his mouth, with which he walks about the whole day. Or, if a weasel should cross the road, he will not advance a step till he has thrown three stones over the road. If he find a serpent in his house, he rears a place of devotion on the spot. He purifies his house often, will not sit upon a grave, or touch a dead person. He is anxious about the interpretation of his dreams, will not offer a sacrifice unless his wife go along with him, or, if she is engaged, he takes the nurse and the little children. He purifies himself with onions; and when he sees a mad or an epileptic person, he spits in their bosom. Such was the character of superstition in the days of Theophrastus. All these whimsical ceremonies were done to prevent mischief, and to avert the wrath of the gods; and therefore perfectly correspond with the definition given above.

Theophrastus's Characters, xvi.

It is only necessary to consider a little the superstitious opinions and practices among Jews and Christians, to be sensible that they have all arisen from mean and absurd ideas of the moral attributes of God; for they have generally entertained noble opinions of his natural attributes. The Jews considered God as a partial Being, who had a predilection for their nation in preference to all others, and preferred external homage and ceremony to moral purity. If the Roman Catholics think consistently, they must esteem God as a Being who can be prevailed upon by the importunity of one dead man to assist another, or as a Being whose patience would be fatigued with hearing prayers constantly. Hence their practice of praying to saints. They in effect believe, however they may deceive themselves, that God is unjust, or they could not believe transubstantiation; for it supposes that God can give commands directly contrary to those principles of belief with which he has endued the human mind. They consider a strict adherence to a variety of ceremonies, to forms, to pomp, and show, as essential to the worship of God: this is treating God as a vainglorious Being. They thought it their duty to extirpate heretics: this was supposing God a cruel and revengeful Being. Even among Protestants, we are sorry to say, a great deal of superstition remains: we have not yet learned to consider God as a spirit, who is to be worshipped in spirit and in truth, as a pure moral benevolent Being; and hence arise all the superstitious practices which prevail among us.

Besides those superstitious opinions and practices which entirely respect our duty to God, there are others which may be termed *vulgar superstitions.* These also arise from imperfect and mean ideas of the moral attributes of God. To believe vulgar prophecies, which are always the effusions of madness or knavery, is to suppose that God, who has drawn a veil over futurity, and only delivers prophecies to accomplish some great moral purpose, sometimes gives them for no purpose at all, or to gratify idle curiosity, or to disclose such a knowledge of what is to happen as is inconsistent with the free agency of man and the moral administration of the world. Nor is it less superstitious to believe in vulgar miracles. To believe in them, is to believe that God suspends the laws of nature for the most trivial purposes, or to countenance fraud and worldly ambition: it is to receive the most extraordinary facts upon the most unsatisfactory evidence. The belief of witchcraft, of apparitions, and the second sight, may be resolved into the same principle. To suppose that God would communicate the power of doing mischief, and of controuling his laws, to any being merely for gratifying their own passions, is unworthy of God. The belief of apparitions is equally inconsistent with the goodness of God (see SPECTRE). The same

(A) We do not pretend to say that this is the sense in which superstition is always used, because it is often used improperly.

Superstition.

same objection rises against the second-sight as against the belief of vulgar prophecies, and may also be extended to omens, to astrology, to things lucky and unlucky, to fortune-telling, &c. As to the different devices and charms for preventing and curing disorders, they resemble in every respect false miracles.

A judicious history of superstition would be a curious and entertaining work, and would exhibit the human character in a remarkable point of view. Superstition is most prevalent among men of weak and uncultivated minds; it is more frequent in the female sex than among men; and abounds more in the rude than in the refined stages of society. The general features of it have been the same in all ages; but it assumes certain peculiarities according to the diversity of character of different nations. It gained admission into the science of medicine at an early period. He who was endowed with superior genius and knowledge was reckoned a magician. Dr Bartolo was seized by the inquisition at Rome in the last century, because he unexpectedly cured a noble-man of the gout. Diseases were imputed to fascination, and hundreds of poor wretches were dragged to the stake for being accessary to them. Mercatus, physician to Philip II. of Spain, a writer of uncommon accuracy and information, appears strongly inclined to deny the existence of fascinatory diseases: but he is constrained to acknowledge them for two reasons; 1st, Because the inquisition had decided in favour of their reality; 2dly, Because he had seen a very beautiful woman break a steel-mirror to pieces, and blast some trees by a single glance of her eyes.

Manchester Transactions, vol. iii.

As the opinions concerning the cause of diseases were superstitious, those concerning the method of curing them were not less so. In the Odyssey we read of a cure performed by a song. Josephus relates, that he saw a certain Jew, named *Eleazar*, draw the devil out of an old woman's nostrils by the application of Solomon's seal to her nose in presence of the emperor Vespasian. Many different kinds of applications were used for expelling the devil. Flagellation sometimes succeeded admirably; purgatives and antispasmodics were other modes of discharging him. Dr Mynsight cured several bewitched persons with a plaster of assafœtida. How the assafœtida was so efficacious, was much disputed. Some thought the devil might consider so vile an application as an insult, and run off in a passion; but others very sagely observed, that as devils are supposed to have eyes and ears, it is probable they may have noses too.

Nor was it only in medicine these superstitious opinions were entertained; they prevailed also in natural philosophy. The pernicious effects in mines, which we now know are occasioned by noxious air, were confidently imputed to the demons of the mine. Even Van Helmont, Bodinus, Strozza, and Luther, attributed thunder and meteors to the devil. Chemists were employed for centuries in search of the philosopher's stone, with which they were to do miracles. It was a common question among philosophers in the 17th century, whether the imagination could move external objects? A question generally decided in the affirmative.

Though superstition be generally the mark of a weak mind, such is the infirmity of human nature, that we find many instances of it among men of the most sublime genius and most enlightened minds. Socrates believed that he was guided by a demon. Lord Bacon believed in witchcraft; and relates that he was cured of warts by rubbing them with a piece of lard with the skin on, and then nailing it with the fat towards the sun on the post of a chamber window facing the sun. Henry IV. one of the most illustrious of monarchs, was very uneasy before his assassination on account of some prophecies *. Sully declares, that one of the considerations that kept him faithful to his master in the most unpromising state of his affairs, was a prediction of La Brosse, that Henry would make his fortune †. The astrologer Morin directed Cardinal Richelieu's motions in some of his journeys ‡. The enlightened Cudworth defended prophecies in general, and called those who opposed the belief of witchcraft by the name of *atheists*; and the predictions of Rice Evans have been supported in the present century by the celebrated names of *Warburton* and *Jortin*. Dr Hoffman, the father of the Modern Theory and Practice of Medicine, in a dissertation published in the large edition of his works in 1747, says, that the devil can raise storms, produce insects, and act upon the animal spirits and imagination; and, in fine, that he is an *excellent optician and natural philosopher* on account of his long experience. Dr Johnson, the leviathan of literature, is supposed to have believed the second sight.

Superstition || Supine.

* *Memoirs of Sully.*

† *Ibid.*

‡ *Bayle*, art. *Morin.*

With respect to the effects of superstition on the human mind, they are indeed deplorable. It chains down the understanding, and sinks it into the most abject and sordid state, and keeps it under the dominion of fear, and sometimes of cruelty. Where once it takes possession, it has a tendency to become extreme, and generally becomes so intolerable, that men of reflection and learning conspire its destruction. The Christian religion gave a violent shock to the heathen superstition; the reformation in a great measure demolished the superstition of the church of Rome; and the superstition which remained among Protestants after their separation from that church has been gradually yielding to the influence of enlightened reason, or to the bold and daring attacks of infidelity and deism. We behold the prospect of its ruins with pleasure, and thank the deists for their zeal; but it is from the firm hope that the religion of Jesus will arise in all its beauty and simple majesty, and be admired and respected as it deserves: for mean and contemptible as superstition certainly is, we would rather see men do what they reckon their duty from superstitious principles, than see anarchy and vice prevail, even though attended with all the knowledge and liberality of sentiment which deism and infidelity can inspire.

SUPERVISOR, a surveyor or overseer.

SUPINATION, in *Anatomy*, the action of a supinator muscle, or the motion whereby it turns the hand so as that the palm is lifted up towards heaven.

SUPINE, in Latin grammar, part of the conjugation of a verb, being a verbal substantive of the singular number and the fourth declension.

There are two kinds of supines: one, called the *first supine*, ending in *um* of the accusative case, which is always of an active signification, and follows a verb of motion; as *abiit deambulatum*. The other, called the *last supine*, and ending in *u* of the ablative case, is of a passive signification, and is governed by substantives or adjectives; as, *facile dictu*, &c.

They have their name, says Probus, and after him Vossius.

Supper.

Voſſius, *quod ad inſtar* ſupinorum *et otioſorum hominum omnia habent confuſa:* or, according to Priſcian, *quod naſcantur a participiis paſſivis, quæ* ſupina *appellata ſunt, quia in infimo loco ſita, totam conjugationis molem ſuſcipiant.*

SUPPER, the evening repaſt.—Suppers that are heavy ſhould be avoided, becauſe the ſtomach is more oppreſſed with the ſame quantity of food in an horizontal poſture than in an erect one, and becauſe digeſtion goes on more ſlowly when we ſleep than when we are awake. They ſhould be eaten long enough before bed-time, that they may be nearly digeſted before going to ſleep; and then a draught of pure water will dilute that which remains in the ſtomach.

1 Definition.

SUPPER of the Lord, otherwiſe called the *Euchariſt*, is a ſacrament ordained by Chriſt in his church, of which the outward part is bread and wine, and the inward part or thing ſignified the body and blood of Chriſt, which the majority of Chriſtians believe to be in ſome ſenſe or other taken and received by the faithful communicants. See SACRAMENT.

2 Controverſies about the outward and viſible ſign.

There is no ordinance of the goſpel which has been the ſubject of more violent controverſies between different churches, and even between different divines of the ſame church, than this ſacrament; and though all confeſs that one purpoſe of its inſtitution was to be a bond of love and union among Chriſtians, it has, by the perverſeneſs of mankind, been too often converted into an occaſion of hatred. The outward and viſible ſign, and the inward and ſpiritual grace, have equally afforded matter of diſputation to angry controvertiſts. Many members of the church of Rome condemn the Greek church and the Proteſtants for uſing leavened bread in the Lord's Supper, contrary to the example ſet them by our Saviour; whilſt the Greek church in general, and ſome Proteſtant ſocieties in particular, unite with the church of Rome in cenſuring all churches which mix not the wine with water, as deviating improperly from primitive practice. See EUCHARIST.

That it was unleavened bread which our Lord bleſſed and brake and gave to his diſciples as his body, cannot be queſtioned; for at the time of the paſſover, when this ordinance was inſtituted, there was no leavened bread to be found in Jeruſalem *. For the mixed cup, the evidence is not ſo deciſive. It is indeed true, as we have obſerved under the article EUCHARIST, that the primitive Chriſtians uſed wine diluted with water; and if we may believe Maimonides †, it was the general cuſtom of the Jews, as well at the paſſover as at their ordinary meals, to add a little water to their wine on account of its great ſtrength; but that this was *always* done, or that it was done by our *Saviour in particular*, there is no clear evidence. Origen indeed affirms ‡, that our Lord adminiſtered in wine unmixed; and he was not a man to hazard ſuch an affirmation, had there been in his days any certain tradition, or ſo much as a general opinion, to the contrary. On this account we have often heard with wonder the neceſſity of the mixed cup inſiſted on by thoſe who without heſitation make uſe of leavened bread; for if it be eſſential to the ſacrament that the very ſame elements be employed by us that were employed by our Saviour, the neceſſity of unleavened bread is certainly equal to that of wine diluted by water.

* *Exod.* xii. 15, 19.

† *In Miſhnam.*

‡ *Hom.* 12. *in Hieremiam.*

But the mixed cup is ſaid to be emblematical of the blood and water which flowed from the ſide of our Lord when pierced by the ſpear of the Roman ſoldier, while the abſence of leaven is emblematical of no particular circumſtance in His paſſion. This argument for the mixture is as old as the era of St Cyprian, and has ſince been frequently urged with triumph by thoſe who ſurely perceived not its weakneſs. The flowing of the blood and water from our Saviour's ſide was the conſequence either of the ſpear's having pierced the *pericardium*, or more probably of an *aſcites* or *hydrothorax*, occaſioned by his cruel and lingering death (ſee MEDICINE, N° 342, 343). But whatever was the cauſe of it, how can the mixing of wine with water in the ſacrament be emblematical of the flowing of blood and water ſeparately? Such a mixture ſurely bears a more ſtriking reſemblance to the reunion of the *ſerum* and *craſſamentum*, after they had been ſeparated by whatever cauſe. See BLOOD.

We urge not theſe objections to the mixed cup from any diſlike that we have to the practice. It is unqueſtionably harmleſs and primitive; and we wiſh that greater regard were paid to primitive practices than the generality of Chriſtians ſeem to think they can claim: but let the advocates for antiquity be conſiſtent; let them either reſtore, together with the mixed cup, the uſe of unleavened bread, or acknowledge that neither the one nor the other is eſſential to the ſacrament. This laſt acknowledgement muſt indeed be made, if they would not involve themſelves in difficulties from which they cannot be extricated. If either the mixed cup or unleavened bread be abſolutely neceſſary to the validity of the ſacrament, why not wine made from the grapes of Judæa? why not that particular kind of wine which was uſed by our Saviour? and where is that wine to be found?

3 Frivolous.

4 About the thing ſignified.

But the controverſies reſpecting the outward part or ſign of the Lord's Supper are of little importance when compared with thoſe which have been agitated reſpecting the inward part or thing ſignified; and of theſe we haſten to give as comprehenſivè a view as the limits preſcribed to ſuch articles will admit.

Our Bleſſed Lord, in the ſame night that he was betrayed, "took bread, and bleſſed it, and brake it, and gave it to the diſciples, and ſaid, Take, eat; this is my body. And he took the cup, and gave thanks, and gave it to them, ſaying, Drink ye all of it; for this is my blood of the new teſtament, which is ſhed for many for the remiſſion of ſins." Such was the inſtitution of the Lord's Supper as it is recorded in the goſpel by St Matthew; and we have the ſame account of it, in almoſt the very ſame words, by three other inſpired writers, St Paul, St Mark, and St Luke. That it was the bread which Chriſt bleſſed and brake that is here called his body, and the wine over which he gave thanks that he ſtyles his blood of the new teſtament, will admit of no reaſonable doubt (A); but in what ſenſe they became ſo, has been the ſubject of many controverſies.

5 Doctrine of the church of Rome.

The church of Rome, which holds, that after conſecration,

(A) Some over-zealous Proteſtants have indeed affirmed, that it was not the conſecrated bread and wine, but thoſe

Supper.

cration, Jesus Christ, God and man, is really, truly, and substantially, contained under the outward appearances of the bread and wine, informs us, that about the middle of the mass, when the priest, taking into his hand, first the bread and then the wine, pronounces over each separately the sacred words of consecration, the substance of these elements is immediately changed by the almighty power of God into the body and blood of Christ; but that all the outward appearances of the bread and wine, and all their sensible qualities remain. This more than miraculous change is called TRANSUBSTANTIATION; and is founded on the philosophy of Aristotle, which resolves all bodies into *matter* and *form* (see METAPHYSICS, N° 142—150.); for it is only the *matter* or imperceptible substance which supports the *forms* or sensible qualities of bread and wine, that is changed into the *substance* or matter of the body and blood of Christ, so that this divine matter, coming into the place of the former earthly matter, supports the same identical *forms* which it supported. Hence we are told, "that Jesus Christ, now present instead of the bread and wine, exhibits himself to us under those very same outward *forms* or appearances which the bread and wine had before the change."

Could this doctrine be true, it would be abundantly mysterious; but to add to the mystery, we are farther informed, that under each kind is contained Jesus Christ whole and entire, his body and blood, his soul and divinity; so that when a man eats what has the appearance of a wafer, he really and truly eats the body and blood, the soul and divinity, of Jesus Christ; and when he afterwards drinks what has the appearance of wine, he drinks the very same body and blood, soul and divinity, which not a minute perhaps before he had wholly and entirely eaten! The ingenious author from whose work we have taken this account of the Romish doctrine concerning the real presence, may perhaps reject our inference that the orthodox members of his church must believe the *soul* and *divinity* of Christ to be *eaten* and *drunk* in the Lord's Supper; but he cannot deny that, according to his statement of the Catholic faith, the soul and divinity are both received whole and entire into the stomach of each communicant. He says indeed, that "communion consists in receiving Jesus Christ whole and entire, his sacred body, his precious blood, his blessed soul, and his adorable divinity, into our *souls*;" but that which was formerly bread and wine unquestionably goes into the *stomachs* of the communicants; and since, according to him, it is now the body and blood of Christ, the soul and divinity must go thither with it, for these four cannot be separated. This our author himself grants. "The Scripture (says he) positively declares, that *Christ rising again from the dead, dieth no more; death shall no more have dominion over him* (Rom. vi. 9.) Consequently his body, his blood, and his soul, shall never more be separated from one another; and as the union of his divine and human natures can never more be broken, so neither can these, his two natures, united in his divine person, be ever separated. From this it necessarily follows, that wherever the body of Christ is, there also his blood, his soul, and his divinity, must of necessity be in like manner."

Supper.

Now, whether we suppose, with our author, that the soul and divinity of Christ directly carry his body and blood with them into the human soul, or, trusting, in some degree to the evidence of sense, believe that the body and blood carry the soul and divinity with them directly into the stomach of each communicant—is it credible, is it possible, that the high and lofty One, who inhabiteth eternity, and whom the oracles of truth assure us that even the heaven of heavens cannot contain, should be *substantially* received *whole* and *entire* into a finite spirit like the human soul, or into a body so limited as the human stomach? Our author says it is; declaring that, "by the blessed *presence* of Jesus Christ, *whole and entire within us*, are communicated to our souls all the heavenly graces which are the effects of the holy communion: such as the sanctification of the soul by an increase of justifying grace; the rendering of it more pure, more holy, more beautiful, more agreeable, in the eyes of God; the cleansing of the soul from all those venial sins and imperfections of which we repent, and preserving us from falling into mortal sins; the uniting of us in a most intimate manner with Jesus Christ, who comes to us in this holy sacrament on purpose to dwell in our souls and abide with us; and the giving us a pledge and earnest of a glorious immortality, to the enjoyment of which it brings us at last, if we persevere to the end in the grace of God."

The consequence of the doctrine of transubstantiation is the *sacrifice of the mass*, by which, it is said, God's acceptance of Christ's sacrifice on the cross is obtained for the actual benefit of those persons in particular for whom the mass is offered. In the work so often quoted, we are told, that "Jesus Christ our redeemer, who is both our high-priest and our victim, who, in order to perfect the work of our redemption, and reconcile man with his offended Creator, offered himself once in a bloody

---

those elements, *together with the whole action* of taking them into his hands, blessing them, breaking the bread, and distributing the bread and wine to the disciples, that Christ calls his body and blood. This novel and singular opinion rests upon no better foundation than a very childish criticism, Our Saviour, after blessing and breaking the bread, gave it to the disciples, saying, in the original, Λαβετε φαγετε ΤΟΥΤΟ εστι το σωμα μου. Now, say our critics, τουτο, in the neuter gender, can never agree with the antecedent αρτος in the masculine, but must refer to all the circumstances of the action taken together, and considered as one complex neuter noun. But this noun, whether complex or simple, certainly denotes what could be *eaten*; and to suppose that our blessed Lord desired his apostles to eat *actions*, is as repugnant to human reason as any doctrine of the church of Rome. The truth is, that the word τουτο, which is more properly a definite article than a demonstrative pronoun (see GRAMMAR, Chap. II.), refers directly to the thing, whatever it was, which our Saviour held in his hand and gave to the disciples; and the clause, when completed, is τουτο ον εστι το σωμα μου; this *being*, this *substance*, *is my body*. There was no necessity for characterising that substance by any analogy to sex, in order that it might be distinguished from every other substance; for the apostles could not but see it in the hand of their Master.

Supper.

bloody manner upon the croſs, in order to communicate and apply to the ſouls of individuals thoſe graces, which, by his death, he merited for mankind in general, continues to offer himſelf daily upon the altar in an unbloody manner, by the miniſtry of his prieſts, in the *maſs*. The ſacrifice of the croſs and that of the maſs are both one and the ſame ſacrifice, becauſe in both the victim is the ſame and the high prieſt the ſame, viz. Jeſus Chriſt. The only difference is in the *manner* of offering. On the croſs he offered himſelf in a bloody manner and actually died; whereas on the altar he is offered up to God in an unbloody manner, not *actually* dead, but under the *appearance* of death;" ſo that the communicants not only eat the man Jeſus Chriſt, but even eat him alive (B)!

It is known to all our readers that this doctrine of tranſubſtantiation was one cauſe of the breach between the church of Rome and thoſe various ſocieties which call themſelves reformed churches. The real and ſubſtantial change of the bread and wine into the body and blood of our Lord is rejected by every reformer as a change contradictory and impoſſible, and fraught with the moſt impious conſequences; and volumes have been written to expoſe the weakneſs of thoſe arguments which have ſo often been vainly urged in its ſupport. It has been ſhown to imply numberleſs abſurdities, ſuch as, that the ſame thing can be in a million of different places, *whole* and *entire*, at the ſame inſtant of time; that it is above 1800 years old, and yet may be not more than one minute; that *forms* or ſenſible qualities are real things independent of their ſubject and the ſentient beings who perceive them; that the infinite and eternal God, who created and ſuſtains the univerſe, is himſelf wholly and ſubſtantially comprehended by the human ſoul; and that the half, or fourth, or tenth part of the body of Chriſt, is equal to the whole of that body. That theſe are neceſſary conſequences of tranſubſtantiation has been ſo completely proved in various works (C) to which every reader may have acceſs, that it is needleſs for us to repeat arguments ſo hackneyed; but there are two objections to that doctrine, which, as we do not remember to have met with them elſewhere, and as they appear to us abſolutely concluſive, it may be worth while to ſtate in this place.

6 Implies numberleſs contradictions,

The advocates for the real preſence in the Lord's Supper contend, that every word relating to that ordinance is to be taken in the ſtricteſt and moſt literal ſenſe, and they affect to triumph over the Proteſtants, becauſe their notions of the ſacrament cannot be ſupported without having recourſe to figure and metaphor. This however is a very vain triumph; for we heſitate not to affirm, that ſuppoſing tranſubſtantiation poſſible, and even capable of proof, there is not in the whole New Teſtament a ſingle word or a ſingle phraſe which, if interpreted *literally*, gives the ſlighteſt countenance to that wonderful doctrine. The reader will remember, that tranſubſtantiation, as we have ſtated it from a dignitary of the Romiſh church, and as it is in fact ſtated by the council of Trent (D), conſiſts in a change of the *matter*, *imperceptible ſubſtance*, or *ſubſtratum* of the bread and wine into the *matter*, *imperceptible ſubſtance*, or *ſubſtratum* of Chriſt's body and blood; for all parties agree that the ſenſible qualities of the bread and wine remain, and, according to the Romaniſt, are after conſecration either ſupported by the *matter* of Chriſt's body and blood, or hung upon nothing. But the phraſe τουτο εστι το σωμα μου, 7 is contrary to Scripture,

(B) This whole account of the Romiſh doctrine reſpecting the ſacrament of the Lord's Supper is taken from a work in two ſmall volumes, called *The Sincere Chriſtian inſtructed in the Faith of Chriſt, from the Written Word.* Its author is a man of learning, and great perſonal worth: and as he fills a high ſtation in the church of Rome, we cannot doubt but that he has given a fair view of the doctrine of that church reſpecting this and every other article of which he treats. We are ſorry however that his zeal ſhould have impelled him, in a *popular* work, to write in the manner that he has done of the ſalvation of thoſe who are not members of his church, or who cannot embrace all his opinions; for if his doctrine on this ſubject be implicitly received by thoſe "over whom he has the rule, and for whoſe ſouls he is appointed to watch," they muſt neceſſarily look upon the majority of their fellow-citizens as reprobates doomed to eternal perdition. Let this be our apology for treating ſome of thoſe opinions, which he thinks ſo abſolutely neceſſary to ſalvation, with leſs ceremony than perhaps we ſhould have done, had he leſs poſitively pronounced our damnation for not having it in our power to embrace them. He is not indeed much leſs ſevere on the moſt virtuous heathens, though they never ſaw the New Teſtament, or heard the doctrines of his church preached. But perhaps this ſeverity may be occaſioned by the following queſtion of Cicero: "Cum fruges, *Cererem;* vinum, *Liberum* dicimus, genere nos quidem ſermonis utimur uſitato: ſed ECQUEM TAM AMENTEM eſſe putas, qui illud, quo veſcatur, deum credat eſſe?" *De Natura Deorum*, lib. iii. cap. 16.

(C) Among other works on this ſubject, we may confidently recommend to the reader a ſmall tract publiſhed by Dr Abernethy Drummond, about thirty years ago, in the form of *A Dialogue between Philalethes and Benevolus.* In that treatiſe, together with a defence of it, which were both printed for Balfour and Drummond, Edinburgh, the abſurd conſequences which we have mentioned are, by arguments unanſwerable, proved to flow from the doctrine of tranſubſtantiation; and the artful ſophiſtry, by which a very acute genius endeavoured to keep theſe conſequences out of ſight, is detected and expoſed on acknowledged principles of the ſoundeſt metaphyſics.

(D) The canon of that council which eſtabliſhes tranſubſtantiation is thus tranſlated by the author of *The Sincere Chriſtian Inſtructed*: "If any man ſhall ſay, that in the bleſſed ſacrament of the Eucharift the ſubſtance of the bread and wine remains along with the body and blood of our Lord Jeſus Chriſt, and ſhall deny that wonderful and ſingular converſion of the whole ſubſtance of the bread into the body, and of the whole ſubſtance of the wine into the blood, the appearances of the bread and wine only remaining, which converſion the Catholic Church calls *tranſubſtantiation*, let him be anathema."

Supper.

μου, if taken in the literal ſenſe, cannot poſſibly denote the conſequence of ſuch a change as this; for every perſon at all acquainted with the Greek language, eſpecially the language of the Peripatetic ſchool, knows that το σωμα μου ſignifies, not the *matter* or *ſubſtratum* of my body diveſted of its ſenſible qualities; but the body of me in its natural ſtate, conſiſting of *matter* and *qualities*, or *matter* and *form united*. Unleſs therefore the *ſenſible qualities*, as well as the *matter* of the bread and wine, give place to the ſenſible *qualities* as well as the *matter* of our Saviour's body and blood, and unleſs he appear glorified on the altar as he appeared on the mount at his transfiguration, the words το σωμα μου muſt be interpreted figuratively. Had the apoſtles underſtood their Maſter's words in the ſenſe in which they are underſtood by the church of Rome, they would have rendered them into Greek, not τουτο εστι το σωμα μου, "this is my *body*," but τουτο εστι ἡ ὑλη του σωματος μου, "this is the *matter* of my body." In like manner, when St John relates* that Jeſus ſaid, "Whoſo eateth my fleſh and drinketh my blood, hath eternal life, and I will raiſe him up at the laſt day," had he underſtood his adorable Maſter to ſpeak of his fleſh and blood in the Euchariſt in the ſenſe in which they are taught to be there by the church of Rome, he would have repreſented him as ſaying, not Ὁ τρωγων μου την σαρκα, και πινων μου το αἱμα, but Ὁ τρωγων την ὑλην μου της σαρκος, και πινων την ὑλην μου του αἱματος, "whoſo eateth the *matter* of my fleſh, and drinketh the *matter* of my blood, hath eternal life, and I will raiſe him up at the laſt day."

* Chap. vi. verſe 54.

But further, ſuppoſing this ſingular converſion poſſible in itſelf, it cannot be rendered credible, however ſtated in any language that ever was or ever will be ſpoken by man. At firſt ſight it may appear paradoxical to affirm, that a poſſible fact cannot be ſo related as to obtain credit; but that tranſubſtantiation, if poſſible, is ſuch a fact, will be apparent on the ſlighteſt conſideration.

8 and incapable of proof.

The relation that ſubſiſts between things and words is arbitrary; ſo that what is termed *body* in Engliſh, is σωμα in Greek, and *corpus* in Latin; and the ſame thing might with equal propriety (had the authors of theſe languages ſo pleaſed) have been expreſſed in the firſt by *ſoul*, in the ſecond by νους, and in the third by *anima*. (See LANGUAGE, N° 3, &c.) The conſequences of this are, that there is no univerſal language ſpoken; that the natives of one country underſtand not the ſpeech of thoſe of another; and that different men ſpeaking the ſame language are perpetually liable to miſtake each other's meaning. Between the *ſubſtrata* of bodies and their *ſenſible qualities* there is a relation founded in nature, ſo that the ſenſible qualities which indicate the ſubſtance to which they belong, to be *gold*, for inſtance, in one country, indicate the ſame thing in every other country, and have done ſo from the beginning of time. The ſenſible appearances of bodies therefore are an univerſal language, the language of the Author of Nature, by which he declares to his creature man, that though the ὑλη πρωτη, or primary matter of all bodies, may be the ſame kind of ſubſtance; yet the ὑλη προσεχης of one body, or the internal combination of its primary parts, differs from that of another; that gold, for inſtance, has a different *ſubſtratum* or *baſis* from iron, lead, or ſilver; that the internal organization or ſtructure of the body of an ox is different from that of a horſe; and that the *internal ſubſtance* or *ſubſtratum* which exhibits the appearances of bread and wine is different from that which ſupports the ſenſible qualities of fleſh and blood (ſee METAPHYSICS, Part I. Chap. I. and Part II. Chap. I. and II.). Suppoſing therefore the doctrine of tranſubſtantiation to be poſſible and even true, it would ſtill be impoſſible, by any ſtatement of it in human language, or by any argument urged in its ſupport, to render that doctrine an object of rational belief; for if it be ſaid that the words τουτο εστι το σωμα μου were ſpoken by a divine perſon, who could neither be deceived himſelf nor intend to deceive us, it may be replied, that the ſenſible appearances of bread and wine, which are confeſſed to remain, are likewiſe the language of a divine perſon, even of the Creator and Governor of heaven and earth; that this language addreſſed to the ſight, the taſte, the touch, and the ſmell, is equally intelligible to all nations; that ſince the creation of the world its meaning has never been miſtaken by the ſcholar or the clown, the ſage or the ſavage, except in this ſingle inſtance of our Lord's fleſh and blood exhibiting the ſenſible appearances of bread and wine; and that it is therefore infinitely more probable that the members of the church of Rome ſhould miſtake the meaning of the words τουτο εστι το σωμα μου, which, though ſpoken by Chriſt, are part of the language of men, and liable to all its ambiguities, than that all mankind ſhould miſtake the language of God himſelf, which is liable to no ambiguities, and which was never in any other inſtance miſunderſtood by a ſingle individual. Should tranſubſtantiation therefore be really true, its truth can never be proved or rendered probable, but by an immediate operation of the ſpirit of God on the mind of man; and he who is conſcious of no ſuch operation on his own mind, may reſt aſſured that the Father of mercies, who knows whereof he is made, will never bring upon him, for his incredulity in this inſtance, any of the anathemas denounced by the church of Rome upon thoſe who place implicit confidence in the univerſal language of Him who created them, in oppoſition to her figurative and contradictory interpretations of the written word. Of the tranſubſtantiation of the elements a viſible miracle would afford no proof. Had the water been changed into wine at the marriage in Cana of Galilee, for the expreſs purpoſe of bearing teſtimony to this ſingular converſion, what muſt have been the conſequence on the minds of thoſe who witneſſed that miracle? Nothing, we think, but ſcepticiſm or diſtruſt of their own faculties; for they would have had the very ſame evidence that *no* ſubſtantial change was wrought on the elements, as that the water was *actually* turned into wine.

Though the reformed churches unanimouſly reject the doctrine of tranſubſtantiation, and of courſe the ſacrifice of the maſs, its inſeparable conſequence, they are far from being agreed among themſelves reſpecting the nature of the Lord's Supper; and the notions of this ordinance entertained by ſome of them appear to us as untenable as any part of the doctrine of the church of Rome. The Lutherans believe, that the body and blood of Chriſt are really and ſubſtantially preſent with the bread and wine; that the body is really and truly eaten, and the blood really and truly drunk, by the communicants; and that whatever motion or action the bread has, the body has the ſame*. According to them, therefore,

9 Doctrine of the Lutherans incredible.

* *Luther. Cogit. M.* 400. *Gerhard in Loc. Theol. de Sacra Cœna.*

Supper.

therefore, the ſame ſenſible appearances are exhibited by two ſubſtances united in ſome inexplicable manner, which is neither a perſonal union, nor incorporation, nor the incloſure of the body within the bread; nor does it laſt longer than while the ſacrament is celebrating. This union is generally called CONSUBSTANTIATION; but they reject the term, contenting themſelves with aſſerting the real preſence, without preſuming to define the mode by which the body and blood of Chriſt are united to the ſacramental elements.

It would be ſuperfluous to waſte time in replying to this doctrine. Every reader ſees that it implies the poſſibility of the ſame thing's being whole and entire in a million of places at one and the ſame inſtant of time, which has been ſo often urged as an unanſwerable objection to the Romiſh doctrine; and it is fraught with this additional abſurdity peculiar to itſelf, that two bodily ſubſtances may at once occupy the ſame place, which is directly contrary to our notions of ſolidity. It may be obſerved too, that whatever be the real ſenſe of our Saviour's words, he ſays expreſsly, "This is my body"—this thing which I give you, and which you ſee and feel; whereas, had he meant what Luther and his followers teach, he would ſurely have ſaid, "*With* this bread receive my body, *with* this cup receive my blood."

10 Of the early Calviniſts

The notions of ſome of the early Calviniſts reſpecting the Lord's Supper are very myſterious, and expreſſed in language of which we are not ſure that we underſtand the meaning. In the year 1561 an attempt was made in France to bring the Catholics and Proteſtants to an uniformity of doctrine on this great topic of controverſy; and deputies were appointed by both parties to meet at *Poiſſy*, and debate the queſtion in a friendly manner. The principal managers on the ſide of the Catholics were the cardinals of *Lorraine* and *Tournon;* thoſe on the ſide of the Proteſtants were *Beza* and *Peter Martyr*. After ſeveral meetings, diſputes, and violent ſeparations, the Proteſtant deputies declared their faith in the following words: "We confeſs, that Jeſus Chriſt, in the Supper, does truly give and exhibit to us the ſubſtance of his body and blood by the efficacy of his Holy Spirit; and that we do receive and eat ſpiritually, and by faith, *that very body which was offered and immolated for us*, ſo as to be bone of his bone and fleſh of his fleſh, to the end that we may be enlivened thereby, and receive what is conducive to our ſalvation. And becauſe faith, ſupported by the word of God, makes thoſe things preſent, which it apprehends, and by that faith we do in *deed* and *reality* receive the *true natural* body and blood of Chriſt, by the power of the Holy Spirit; by this means, we confeſs and acknowledge the preſence of his body and blood in the Supper." One of the Catholic delegates expreſſing his diſlike of this laſt clauſe, the Proteſtant miniſters gave the following explanation of their ſentiments: "No diſtance of place can hinder us from communicating of the body and blood of Chriſt, for the Lord's Supper is a heavenly thing; and though on earth we receive with our mouths bread and wine, which are the true ſigns of his body and blood, yet by faith, and the efficacy of the Holy Ghoſt, our minds, which are fed with this food, *are rapt up into heaven*, and enjoy the preſence of the body and blood; and that by this means it may be ſaid that the body is truly joined to the bread, and the blood to the wine; but after the manner of a ſacrament, and not at all according to place or natural poſition *."

If the reader can diſcover the preciſe meaning of theſe paſſages, his ſagacity exceeds ours. That the Proteſtant deputies believed, or profeſſed to believe, that the *natural* body and blood of Chriſt are by the faithful received in the Lord's Supper, is indeed evident; but their notions reſpecting the manner of this reception are very unintelligible, if not contradictory. In the former quotation, they confeſs that Chriſt's body and blood are really preſent in the ſacrament; that they are made preſent by faith (we ſuppoſe the faith of the communicants); and that the *very body* which was offered and immolated for us is eaten *ſpiritually* and by *faith*. In the latter quotation, they ſeem to ſay that Chriſt's body and blood are in heaven, at a great diſtance from the true ſigns of them; that on earth the communicants receive only theſe ſigns, which are bread and wine; but that, by faith and the efficacy of the Holy Spirit, their minds, during actual communion, are rapt up into heaven, where they enjoy the preſence of the body and blood; and that by this means the body and blood are truly joined to the bread and wine through the medium of the mind of the communicant, which is at once preſent both to the ſign and to the thing ſignified. To this myſterious doctrine it is needleſs to urge objections. Every man who is accuſtomed to think, and to uſe words with ſome determinate meaning, will at once perceive that the authors of this declaration muſt have had very confuſed notions of the ſubject, and have pleaſed themſelves with ſound inſtead of ſenſe, ſatisfied that they could not be wrong if they did not ſymbolize with the Lutherans or the Council of Trent.

* *Thuanus*, lib. 28. See alſo *Johnſon's Unbloody Sacrifice*, vol. i.

11 unintelligible.

12 Of the churches of Britain.

The churches of England and Scotland, in their eſtabliſhed doctrines reſpecting the Lord's Supper, appear to be Calviniſtical; but the compilers of the Thirty-nine Articles and of the Confeſſion of Faith muſt have been much more rational divines than Beza and Peter Martyr. They agree in condemning the doctrine of tranſubſtantiation as contrary to common ſenſe, and not founded in the word of God; they teach, that to ſuch as rightly, worthily, and with faith, receive the ſacrament, the bread which we break is a partaking of the body of Chriſt, and the cup of bleſſing a partaking of the blood of Chriſt; and they add, that the body and blood of Chriſt are eaten and drunk, not corporally or carnally, but only after a heavenly and ſpiritual manner, by which the communicants are made partakers of all the benefits of his death †. In one important circumſtance theſe two churches ſeem to differ. The Confeſſion of Faith, as we underſtand it ‡, affirms, that in the Lord's Supper there is no ſacrifice made at all. The thirty-firſt article of the church of England likewiſe condemns the Popiſh ſacrifice of the maſs as a *blaſphemous fable* and *dangerous deceit;* but in *the order for the adminiſtration of the Lord's Supper or Holy Communion*, the celebrator "beſeeches God moſt mercifully to accept the alms and *oblations* of the congregation," and again "to accept *their ſacrifice of praiſe* and thankſgiving:" from which petitions many have inferred that, in the Lord's Supper, that church offers a commemorative and euchariſtical ſacrifice. This inference ſeems not to be wholly without foundation. In the order for the adminiſtration of the Lord's Supper, according to the form of the Book of Common Prayer ſet forth by act of parliament

† *Articles of the Church of England*, art. 28. and *Confeſſion of Faith*, chap. 29.

‡ Chap. xxix. § 3.

Supper.

liament in the ſecond and third years of King Edward the Sixth, the elements were ſolemnly offered to God as a ſacrifice of praiſe and thankſgiving; and though the the prayer containing that oblation was, at the review of the liturgy ſome years afterwards, removed from the prayer of conſecration, to which it was originally joined, and placed where it now ſtands in the poſt communion ſervice; yet the very act of parliament which authorized that alteration, calls King Edward's "a very godly order, agreeable to the word of God and the primitive church, and very comfortable to all good people deſiring to live in Chriſtian converſation."

13 Some Engliſh divines hold the Lord's Supper to be a euchariſtical ſacrifice.

The Engliſh church, however, has not poſitively determined any thing reſpecting this great queſtion; and whilſt ſhe condemns the doctrine of the real preſence, with all its dangerous conſequences, ſhe allows her members to entertain very different notions of this holy ordinance, and to publiſh theſe notions to the world. Accordingly, many of her moſt eminent divines (E) have maintained that, in the celebration of the Lord's Supper, the elements of bread and wine are offered to God as a ſacrifice commemorative of Chriſt's one ſacrifice for the ſins of the whole world; that theſe elements, though they undergo no ſubſtantial change, yet receive ſuch a divine virtue by the deſcent of the Holy Ghoſt, as to convey to the worthy communicant all the benefits of Chriſt's paſſion; that they are therefore called his body and blood, becauſe being, after their oblation, eaten and drunk in remembrance of Him, they ſupply the place of his body and blood in the feaſt upon his ſacrifice; and that it is cuſtomary with our Saviour to give to any thing the name of another of which it completely ſupplies the place, as when he calls himſelf the door * of the ſheep, becauſe there is no entrance into the church or kingdom of God but by faith in him. They obſerve, that the Euchariſt's being commemorative, no more hinders it from being a proper ſacrifice, than the typical and figurative ſacrifices of the old law hindered them from being proper ſacrifices: for as to be a type doth not deſtroy the nature and notion of a legal ſacrifice, ſo to be repreſentative and commemorative, doth not deſtroy the nature of an evangelical ſacrifice. To prove that, in the celebration of the Lord's Supper, there is a real ſacrifice offered to God as well as a ſacrament received by the communicants, they appeal to St Paul, who ſays expreſsly †, that "Chriſtians have an *altar*, whereof they have no right to eat who ſerve the tabernacle," and who by contraſting the cup of the Lord with the cup of devils, and the table of the Lord with the table of devils ‡, teaches plainly, that thoſe cups and thoſe tables had the ſame ſpecific nature. That the *table of devils* ſpoken of by the apoſtle was the Pagan altars, and the *cup of devils* the wine poured out in libations to the Pagan divinities, will admit of no diſpute; and therefore, ſay the advocates for the euchariſtical ſacrifice, the table of the Lord muſt be the Chriſtian altar, and the cup of the Lord the wine offered to God as the repreſentative of the blood of Chriſt; otherwiſe there would not be that *abſurdity* which the apoſtle ſuppoſes, in the ſame perſon drinking the cup of the Lord and the cup of devils, and partaking of the Lord's table and the table of devils. They obſerve farther, that in all the ancient liturgies extant there is a ſolemn form of oblation of the ſacramental elements, and that all the Chriſtian writers from the ſecond century downwards treat of the Lord's Supper as a ſacrifice as well as ſacrificial feaſt, having indeed no value in itſelf, but acceptable to God as repreſenting Chriſt's one ſacrifice for the ſins of the world. Our limits will not permit us to give even an abſtract of their arguments; but the reader who ſhall attentively peruſe *Johnſon's unbloody Sacrifice and Altar unveiled and ſupported*, will diſcover that their notions are better founded than probably he ſuppoſes, and that they are totally irreconcileable with the doctrine of tranſubſtantiation and the Popiſh ſacrifice of the *maſs*.

* *St John* x. 7.

† *Heb.* xiii. 10.

‡ 1 *Cor.* x. 16, &c.

14 Others, a mere memorial;

Other Engliſh divines of great learning, with the celebrated Hoadley biſhop of Wincheſter at the head of them, contend ſtrenuouſly that the Lord's Supper, ſo far from being a ſacrifice of any kind, is nothing more than bread and wine reverently eaten and drunk, in remembrance that Chriſt's body was broken and his blood ſhed in proof of his Father's and his own love to mankind; that nothing is eſſential to the ſacrament but this remembrance, and a ſerious deſire to honour and obey our Saviour as our head; that the ſacrament might be celebrated without uttering one prayer or thankſgiving, merely by a ſociety of Chriſtians, whether ſmall or great, jointly eating bread and drinking wine with a ſerious remembrance of Chriſt's death; that St Paul enjoins a man to examine himſelf before he eat of that bread and drink of that cup, not to diſcover what have been the ſins of his paſt life in order to repent of them, but only that he may be ſure of his remembering Chriſt's body broken and his blood ſhed; that, however, it is his duty in that as in every other inſtance of religious worſhip to reſolve to obey from the heart every precept of the goſpel, whether moral or poſitive; and that to partake worthily of the Lord's Supper is acceptable to God, becauſe it is paying obedience to one of theſe precepts; but that no particular benefits or privileges are annexed to it more than to any other inſtance of duty. Biſhop Hoadley acknowledges, that when St Paul ſays *, "The cup of bleſſing which we bleſs, is it not the communion of the blood of Chriſt? The bread which we break, is it not the communion of the body of Chriſt?" he has been ſuppoſed by many learned men to affirm, that all the benefits of Chriſt's paſſion are in the Lord's Supper conveyed to the worthy communicant; but this (ſays he) is an idea which the apoſtle could not have in his thoughts as at all proper for his argument. The Greek word κοινωνια and the Engliſh *communion* ſignify only a partaking of ſomething in common with others of the ſame ſociety; and the apoſtle's meaning (he ſays) can be nothing more, than that in the Lord's Supper we do not eat bread and drink wine as at an ordinary meal, but as memorials of the body and blood of Chriſt, in honour to *him* as the *head* of that body of which we are all *members*. That the word κοινωνια is not meant to denote any inward or ſpiritual part of the Lord's Supper, he thinks evident, becauſe the ſame word is uſed with regard to the cup and the table of idols, where no

* 1 *Cor.* x. 16.

 ſpiritual

(E) The archbiſhops Laud and Wake; the biſhops Poynet, Andrews, Bull, and Patrick; the doctors Hickes, Grabe, and Brett; Meſſrs Bingham, Johnſon, Mede, Wheatly, Scandaret, Bowyer, &c.

Supper.

spiritual part could be thought of, and in an argument which supposes an idol to be nothing †.

† *A Plain Account of the Nature and End of the Lord's Supper.*

To this view of the nature and end of the Lord's Supper, it must appear no small objection, that "he who eateth and drinketh unworthily is said to be *guilty of the body and blood of the Lord, and to eat and drink a judgement to himself, not discerning the Lord's body.*" No doubt it would be sinful to eat and drink a mere memorial of Christ's death without serious dispositions; but we cannot conceive how a little wandering of the thoughts, which is all the unworthiness which the author thinks there can be on such an occasion, should be a sin of so deep a dye as to be properly compared with the guilt of those who murdered the Lord of life. Other divines, therefore, feeling the force of this and similar objections, steer a middle course between the mere memorialist and the advocate for a real sacrifice in the holy Eucharist, and insist that this rite, though no sacrifice itself, is yet a feast upon the one sacrifice offered by Christ and slain upon the cross. The most eminent patrons of this opinion have been Dr Cudworth, Bishop Warburton, and the present bishop of Chester; and they support it by such arguments as the following: "In those ages of the world when victims made so great a part of the religion both of Jews and Gentiles, the sacrifice was always followed by a religious feasting on the thing offered; which was called the *feast upon, or after the sacrifice*, and was supposed to convey to the partakers of it the benefits of the sacrifice. Now Jesus (say they), about to offer himself a sacrifice on the cross for our redemption, did, in conformity to general practice, institute the *last supper*, under the idea of *a feast after the sacrifice;* and the circumstances attending its institution were such, they think, that the apostles could not possibly mistake his meaning. It was just before his passion, and while he was eating the paschal supper, which was a Jewish *feast upon the sacrifice*, that our blessed Lord instituted this rite; and as it was his general custom to allude, in his actions and expressions, to what passed before his eyes, or presented itself to his observation, who can doubt, when, in the very form of celebration, we see all the marks of a *sacrificial supper*, but that the divine institutor intended it should bear the same relation to his *sacrifice on the cross* which the *paschal supper* then celebrating bore to the oblation of the *paschal lamb?* If this was not his purpose, and if nothing more was intended than a general memorial of a dead benefactor, why was this instant of time preferred for the institution to all others throughout the course of his ministry, any one of which would have been equally commodious? Indeed any other time would have been more commodious for the institution of a mere memorial; for the paschal lamb and unleavened bread were certainly a sacrifice; and the words used by our Saviour, when he gave the bread and wine to the apostles, were such as must necessarily have led them to consider that bread and wine as bearing the same relation to his sacrifice that the paschal supper bore to the paschal sacrifice. At that Jewish feast, it was the custom of every father of a family to break the unleavened bread, and to give to every guest a portion, saying, "This is the bread of affliction, which our fathers did eat in the land of Egypt:" a custom which, we may be sure, that Christ, as father of his family, would religiously observe. The apostles knew well that they were not eating the identical bread which their fathers did eat in Egypt, but the feast upon the sacrifice then offered in commemoration of their redemption from Egyptian bondage; and therefore when they saw their Master after supper break the bread again and give it to each of them, with these remarkable words, "This is my body which is given for you, do this in remembrance of me," they must have concluded, that his meaning was to institute a rite which should to the end of the world bear the same relation to his sacrifice that the paschal supper bore to the sacrifice of the passover.

15 and others, a feast upon our Saviour's sacrifice.

This inference, from the circumstances attending the institution, Bishop Warburton thinks confirmed by St Paul's mode of arguing with the Corinthians, on their impiety and absurdity in partaking both of the Lord's table and the table of devils; for "what (says he) had the eaters of the sacrifices to do with the partakers of the bread and wine in the Lord's Supper, if the Lord's Supper was not a feast of the same kind with their feasts? If the three feasts, Jewish, Pagan, and Christian, had not one common nature, how could the apostle have inferred that this intercommunity was inconsistent? *Ye* CANNOT (says he) *drink the cup of the Lord and the cup of devils; ye* CANNOT *be partakers of the Lord's table and the table of devils.* For though there might be *impiety* in the promiscuous use of Pagan and Christian rites of any kind, yet the *inconsistency* arises from their having a common nature, and consequently, as they had opposite originals, from their destroying one another's effects in the very celebration. Sacrifices, and feasts upon sacrifices, were universally considered as *federal* rites; and therefore the Lord's table and the table of devils being both *federal* rites, the same man could no more be partaker of both, than he could at once engage to serve both God and the devil. This is the apostle's argument to the wise men, to whom he appeals; and we see that it turns altogether upon this postulatum, that the Christian and Pagan feasts had the same specific nature, or were both feasts upon sacrifices. If this be admitted, it is easy to see why St Paul deemed those who ate and drank unworthily guilty of the body and blood of the Lord; for if the Lord's Supper be a feast upon his sacrifice, it must have been considered as the means of conveying to the communicants all the benefits of his death and passion; and the profanation of such a rite, by rendering his death ineffectual, might be fitly compared and justly equalled to the enormous guilt of those by whom his blood was shed." In reply to Bishop Hoadley's remarks upon the word κοινωνια, his brother bishop observes, that "had the apostle meant what the learned writer makes him to mean, he would doubtless have said κοινωνια ὑμων εις το σωμα, 'your communion in the body—your eating it jointly.' St Paul (continues he) knew how to express himself properly, as appears from a passage in his epistle to the Philippians, where, professedly speaking of the joint participation of a blessing, he uses these words, κοινωνια ὑμων εις το ευαγγελιον, 'your communion in the gospel.' To the other remark, that no spiritual part could be thought of in the table of idols, because an idol is said by the apostle to be *nothing*, Bishop Warburton replies, "that by St Paul the Gentiles are said to have sacrificed to devils, and those who ate of such sacrifices to have had communion with devils: now the *devil* (continues his Lordship) was in St Paul's opinion *something*." But the inference which the

Supper || Suppofition.

the apoftle draws from the acknowledged truth, that the cup of bleffing which we bleffs is the communion of the blood of Chrift, and the bread which we break the communion of the body of Chrift, puts his meaning, our author thinks, beyond all doubt. He fays *, that the partaking of one bread makes the receivers of *many* to become *one body*. A juft inference, if this rite be of the nature of a *feaft upon the facrifice;* for then *the communion of the body and blood of Chrift* unites the receivers into one body by an equal diftribution of one common benefit. But if it be only a general commemoration of a deceafed benefactor, it leaves the receivers as it found them, not *one body*, but *many feparate profeffors* of one common faith.

* 1 *Cor.* x. 27.

16 The ordinance not generally underftood.

Thus have we given fuch a view as our limits would permit us to give, of the principal opinions that have been held refpecting the nature and end of the Lord's Supper. It is an ordinance which feems not to be generally underftood; though, being intended to fhow forth the Lord's death till he come, it is furely of fufficient importance to engage the attention of every ferious Chriftian. The moft confiderable Proteftant divines who have expreffly written upon it are, Johnfon in his *Unbloody Sacrifice;* Cudworth in his *Difcourfe concerning the true Nature of the Lord's Supper;* Hoadley in his *Plain Account;* and Warburton in his *Rational Account*. The notions of Cudworth and Warburton are the fame, and perhaps they differ not fo much from thofe of Johnfon as many readers feem to imagine. At any rate, the arguments by which Warburton fupports his doctrine muft have fome force, fince it is faid that Hoadley himfelf acknowledged they would be unanfwerable, if it could be proved that the death of Chrift was a real facrifice.

SUPPLEMENT, in literature, an appendage to fupply what is wanting in a book. Books of various kinds require fuch an appendage; but none fo much as a dictionary of arts and fciences, which, from the progreffive courfe of phyfical fcience, cannot be completed without it.

SUPPORTED, in *Heraldry*, a term applied to the uppermoft quarters of a fhield when divided into feveral quarters, thefe feeming as it were fupported or fuftained by thofe below. The chief is faid to be fupported when it is of two colours, and the upper colour takes up two-thirds of it. In this cafe it is fupported by the colour underneath.

SUPPORTERS, in *Heraldry*, figures in an atchievement placed by the fide of the fhield, and feeming to fupport or hold up the fame. Supporters are chiefly figures of beafts: figures of human creatures for the like purpofe are called *tenants*.

SUPPOSITION, in *Mufic*, is when one of the parts dwells on a note, while another part makes two or more leffer notes equivalent to it, by conjoint degrees.

Suppofition is defined by a late author the ufing of two fucceffive notes, of the fame value as to time; the one whereof, being a difcord, fuppofes the other a concord.

The harmony, Mr Malcolm obferves, is always to be full on the accented parts of the bar or meafure; but, on the unaccented, difcords may tranfiently pafs, without any offence to the ear. This tranfient ufe of difcords, followed by concords, make what we, after the French, call *fuppofition*.

Suppofition || Sur.

Concords by fuppofition are thofe where the continued bafs adds or fuppofes a new found below the fundamental bafs; whence fuch concords always exceed the extent of the octave. Of thefe concords there are three forts, all which are concords of the feventh: the firft, when the added found is a third below the fundamental found; fuch is the concord of the ninth: and if the concord of the ninth is formed by the mediant, added below the fenfible concord in the minor mode, then the concord is called the *fuperfluous fifth*. The fecond kind is, when the fuppofed found is a fifth below the fundamental found, as in the concord of the fourth or eleventh; and if the concord is fenfible, and the tonic be fuppofed, this concord is called the *fuperfluous feventh*. The third kind is that where the fuppofed found is below a concord of the diminifhed feventh: if it is a fifth below, i. e. if the fuppofed found be the mediant, the concord is called the concord of the *fourth* and *fuperfluous fifth:* if it is a feventh below, i. e. if the fuppofed found be the tonic, the concord is called the *leffer fixth* and *fuperfluous feventh*.

SUPPOSITORY, a kind of medicated cone or ball, which is introduced into the anus for opening the belly.

It is ufually compofed of common honey, mixed up with either foap or oil, and formed into pieces of the length and thickneffs of the little finger, only pyramidal. To the compofition is fometimes alfo added powder of fcammony, euphorbium, colocynthis, falt, aloes, &c. according to the cafe of the patient.

The fuppofitory was invented for the convenience of fuch as have an averfion to the taking of clyfters; or to be ufed when the difeafe does not allow thereof.

SUPPRESSION, in *Medicine*, is generally ufed to fignify a retention of urine or of the menfes.

SUPPURATION, the fecond way wherein an inflammation terminates; being a converfion of the infpiffated blood and the firft adjacent parts, as the veffels and fat; into pus or matter; which diforder, when it has not yet found an opening, is generally called an *abfcefs*.

SUPRACOSTALES, in *Anatomy*. See *Table of the Mufcles* in ANATOMY.

SUPRALAPSARIANS, in *Theology*, perfons who hold that God, without any regard to the good or evil works of men, has refolved, by an eternal decree, *fupra lapfum*, antecedently to any knowledge of the fall of Adam, and independently of it, to fave fome and to damn others; or, in other words, that God intended to glorify his juftice in the condemnation of fome, as well as his mercy in the falvation of others; and for that purpofe decreed that Adam fhould neceffarily fall, and by that fall bring himfelf and all his offfpring into a ftate of everlafting condemnation.

Thefe are alfo called *antelapfaries*, and are oppofed to fublapfaries and infralapfaries.

According to the fupralapfarians, the object of predeftination is, *homo creabilis et labilis;* and, according to the fublapfarians and infralapfarians, *homo creatus et lapfus*.

SUPRASPINATUS, in *Anatomy*. See *Table of the Mufcles* in ANATOMY.

SUPREMACY, the fuperiority or fovereignty of the king. See SOVEREIGNTY.

SUR, or SHUR, in *Ancient Geography*, a defert of Arabia Petræa, extending between Paleftine and the Arabian gulf; into which the Ifraelites, after marching through

Surat.

through the Red ſea, firſt came (Exod. xv. 22.). Again (Numb. xxxiii. 8.), it is ſaid, that from the ſea they went three days journey into the Wilderneſs of Etham; whence ſome conclude that Etham and Shur are the ſame wilderneſs; or only differ as a part from the whole, Shur being the general name, and Etham that part of it lying neareſt to the place of encampment of the ſame name. We know ſo little of the geography of theſe places, that there is more room for diſputation than for deciſion. As to the route which the Iſraelites followed in their paſſage through the Red ſea, Mr Bryant, we think, has given the moſt ſatisfactory account in his late work on the Plagues of Egypt.—Shur is now called *Corondel*.

SURAT, a city of Indoſtan, belonging to Britain, on the weſtern coaſt of the peninſula, a little to the northward of Bombay, and about 16 miles up the river Tappee. It is but of modern date, and is a moſt remarkable inſtance of the power of trade to bring wealth and population to any ſpot where it can be brought to ſettle. Towards the middle of the 17th century, this place was only the reſort of a few merchants, who, under the ſhelter of an old inſignificant caſtle, laid the firſt foundations of a city now almoſt as large and fully as populous as London within the walls, and containing many fine buildings of Indian architecture, which is partly Gentoo and partly Moriſque. Thoſe of the greateſt note are ſo contrived, that the gateway is defenſible againſt any ſudden irruption of a few armed men. The private apartments lie backwards for the conveniency of the women, of whom the Moors are remarkably jealous. They are fond of having one room, in the midſt of which a fountain keeps playing, and which, by its noiſe, lulls them to ſleep, and refreſhes the room by its coolneſs; but thus a damp is produced, which would be very dangerous to Europeans. They have alſo generally a ſaloon with fountains playing in it, which, with the variegated flower-beds, in which they are very curious, makes a beautiful proſpect. During the intenſe heats of ſummer they have country retirements a little way out of town, where they reſide, or go in parties to amuſe themſelves. The ſtreets are irregularly laid out; but have one property which renders it agreeable to walk in them, viz. that a competent width being left at bottom, the upper ſtories of the houſes project over one another in ſuch a manner, that people may with eaſe converſe from them; by which means the ſtreet is agreeably ſhaded, at the ſame time that a proper ventilation is not impeded, but rather promoted. The ſhops, notwithſtanding the vaſt trade carried on in this great and populous city, have a very mean appearance, owing to the dealers keeping their goods in warehouſes, and ſelling by ſamples.

No place is better ſupplied with proviſions than the city of Surat while its communication with the country remains open. Beſides the unbounded importation, by which every article is brought here in great abundance, the natural productions of the ſoil are excellent, though leſs cheap than in other parts of India, as at Bengal eſpecially; yet in that place, though the cattle and poultry are bought originally at a very low rate, they turn out very dear by the time they are fed for the table. Here, however, all kinds of eatables may be had at a reaſonable price, ready for immediate uſe, and as good as can be found anywhere. The wheat of Surat is famous all over India for its ſingular ſubſtance, whiteneſs, and taſte; and its ſalads and roots are likewiſe of an excellent quality. There are alſo many kinds of wildfowl and other game to be had at an eaſy rate; but for wines and ſpirituous liquors they depend moſtly on importation.

Surat was ſurrounded with a wall in a ſhort time after it had aſſumed the form of a town. The fortification, however, was meant only to prevent the incurſions of the Mahrattas, who had twice pillaged it; ſo that the place was by no means capable of ſtanding any regular ſiege. Even the caſtle appears but a poor defence, being mounted with cannon here and there, without any order, or without any thing like an attempt towards military architecture.

In this city, before the Eaſt India company became inveſted with the poſſeſſion of Bombay, was the preſidency of their affairs on the weſtern coaſt. For this purpoſe they had a factory eſtabliſhed there with great privileges by the Mogul government; and even after the preſidency was eſtabliſhed at Bombay, they continued a factory here at one of the beſt houſes in the city; which yet not being ſpacious enough to contain their effects, they hired another at ſome diſtance from it, and nearer the water-ſide, which was called the new factory. In the mean time, the city flouriſhed, and became the centre of all the Indian trade, being much more frequented for the ſake of foreign merchandiſe than for either the natural productions or manufactures of the country, though they alſo made a conſiderable part of its commerce. In ſhort, there was ſcarce any article of merchandiſe but what was to be found at all times in Surat, almoſt as readily as in London itſelf. While the Mogul government was in its vigour, there was ſuch a ſhow of juſtice kept up, as induced merchants of all religions and denominations to take up their reſidence in the city. The Gentoos eſpecially reſorted thither, in order to avoid the oppreſſions of their own government. Great care indeed was taken that no very flagrant acts of oppreſſion ſhould be committed; ſo that, in what ſometimes happened, appearances were at leaſt kept up; and the oppreſſions of government were chiefly owing to the animoſities and rivalſhip of the merchants themſelves. As an inſtance of the great extent to which commerce was puſhed in Surat, we ſhall here quote from Mr Groſe, what is ſaid by Captain Hamilton of a merchant named *Abdulgafour*, viz. "That he drove a trade equal to the Eaſt India company: for he had known him fit out in a year above 20 ſail of ſhips, between 300 and 800 tons, none of which had leſs of his own ſtock than 20,000l, and ſome of them 25,000l. After that foreign ſtock was ſent away, it behoved him to have as much more of an inland ſtock for the following year's market." On the deceaſe of this merchant, the government ſeized on a million of his money; and his grandſon was not only deprived of all that he poſſeſſed, but barbarouſly murdered through the envy and treachery of his brother merchants, and the rapacity of the governor.

The city of Surat was taken and ruined by the Portugueſe in 1520; and it was not till after this misfortune that it became ſuch a celebrated emporium. All the Indian merchants who had been accuſtomed to trade thither contributed to re-eſtabliſh it; but it was not till near a century after that it became the general ſtaple of Indian

Indian and European merchandise; when the Dutch appearing in the Indian ocean, had deprived the Portuguese of all their conquests on that coast, and almost entirely ruined their trade. The English established a factory here in 1609, the Dutch in 1616, and the French in 1665. In process of time, the Indian seas being greatly infested by pirates, a naval officer was appointed by the Mogul to keep them in awe. This officer was named *Siddee* (A) *Mussoot*, who had been chief of an Ethiopian colony settled at Rajapore. Here he had collected some vessels of considerable force, and carried on some trade, till he was dispossessed by the Mahrattas; upon which he repaired to Bombay, and afterwards to Surat, where he was appointed admiral on that station to the Mogul, with a yearly revenue of about 36,000l. Sterling. Though he had no power, independent of the marine, he seized on the castle, encroached on the town, and appropriated to himself a third part of its revenues, under pretence of arrears due in his appointed revenue. Another third was paid to the Mahrattas, to prevent their depredations upon trade in the open country; but they, not satisfied with this stipulation, watched an opportunity to plunder the town, which was kept in subjection by Siddee Mussoot, till his death which happened in 1756.

Siddee Mussoot was succeeded by his son, who soon rendered himself very disagreeable to the inhabitants. In 1758 the English factory was greatly oppressed by him, and the black merchants treated still worse; on which the latter applied to Mr Ellis the English chief at that time, desiring him to recommend it to the presidency of Bombay to take the castle by force out of the hands of the usurper. This proposal proving agreeable, Admiral Pococke, who was then with his squadron at Bombay, readily concurred in supporting the expedition. The enterprise was conducted with the usual success attending the British arms; and Captain Maitland the conductor took possession of the castle with its revenue in name of the East India company, who were confirmed in the government by grants from the Mogul.

SURCHARGE OF THE FOREST, is when a commoner puts more beasts in the forest than he has a right to. See FOREST.

SURCHARGE of Common, is a disturbance of common of pasture, by putting more cattle therein than the pasture and herbage will sustain, or the party hath a right to do. This injury can only happen where the common is appendant or appurtenant, and of course limitable by law; or where, when in gross, it is expressly limited and certain; for where a man hath common in gross, *sans nombre*, or without stint, he cannot be a surcharge. In this case indeed there must be left sufficient for the lord's own beasts.

The usual remedies for surcharging the common are by the lord's distraining the surplus number, or by his bringing an action of trespass, or by a special action on the case, in which any commoner may be plaintiff. The ancient and most effectual method of proceeding is by writ of admeasurement of pasture.

Writ of Second SURCHARGE, de secunda superoneratione, is given by the statute of Westm. 2. 13 Edw. I. cap. 8. when, after the admeasurement of pasture hath ascertained the right, the same defendant surcharges the common again; and thereby the sheriff is directed to inquire by a jury whether the defendant has in fact again surcharged the common; and if he has, he shall then forfeit to the king the supernumerary cattle put in, and also shall pay damages to the plaintiff.

SURCINGLE, a girdle wherewith the clergy of the church of England usually tie their cassocks. See GIRDLE.

SURCOAT, a coat of arms, to be worn over body armour.

The surcoat is properly a loose thin taffety coat, with arms embroidered or painted on it. Such as is worn by heralds, anciently also used by military men over their armour to distinguish themselves by.

SURD, in *Arithmetic* and *Algebra*, denotes any number or quantity that is incommensurable to unity: otherwise called an *irrational number* or *quantity*. See ALGEBRA, Part I. Chap. IV.

SURETY, in *Law*, generally signifies the same with BAIL.

SURF, is a term used by seamen to express a peculiar swell and breaking of the sea upon the shore. It sometimes forms but a single range along the shore, and at others three or four behind one another extending perhaps half a mile out to sea. The surf begins to assume its form at some distance from the place where it breaks, gradually accumulating as it moves forward till it gain, not uncommonly, in places within the limits of the trade-winds, a height of 15 or 20 feet, when it overhangs at top, and falls like a cascade with great force and a prodigious noise. Countries where surfs prevail require boats of a particular construction very different from the greater part of those which are built in Europe. In some places surfs are great at high, and in others at low water; but we believe they are uniformly most violent during the spring-tides.

It is not easy to assign the cause of surfs. That they are affected by the winds can hardly be questioned; but that they do not proceed from the *immediate* operation of the wind in the places where they happen, is evident from this circumstance, that the surf is often highest and most violent where there is least wind, and *vice versa*. On the coast of Sumatra the highest are experienced during the south-east monsoon, which is never attended with such gales as the north-west. As they are most general in the tropical latitudes, Mr Marsden, who seems to have paid much attention to the subject, attributes them to the trade-winds which prevail at a distance from shore between the parallels of 30 degrees north and south, whose uniform and invariable action causes a long and constant swell, that exists even in the calmest weather, about the line, towards which its direction tends from either side. This swell, when a squall happens or the wind freshens up, will for the time have other subsidiary waves on the extent of its surface, breaking often in a direction contrary to it, and which will again subside as a calm returns, without having produced

(A) When the Abyssinian slaves are promoted to any office under the Mogul government, they are called *Siddees*.

duced on it any perceptible effect. Sumatra, though not continually exposed to the south-east trade-wind, is not so distant but that its influence may be presumed to extend to it; and accordingly at Poolo Pesang, near the southern extremity of the island, a constant southerly sea is observed, even after a strong north-west wind. This incessant and powerful swell rolling in from an ocean, open even to the pole, seems an agent adequate to the prodigious effects produced on the coast; whilst its very size contributes to its being overlooked. It reconciles almost all the difficulties which the phenomena seem to present, and in particular it accounts for the decrease of the surf during the north-west monsoon, the local wind then counteracting the operation of the general one; and it is corroborated by an observation, that the surfs on the Sumatran coast ever begin to break at their southern extreme the motion of the swell not being perpendicular to the direction of the shore. This explanation of the phenomena is certainly plausible; but, as the author candidly acknowledges, objections may be urged to it. The trade-winds and the swell occasioned by them are remarkably steady and uniform; but the surfs are much the reverse. How then comes an uniform cause to produce unsteady effects?

In the opinion of our author it produces no unsteady effects. The irregularity of the surfs, he says, is perceived only within the remoter limits of the trade-winds. But the equatorial parts of the earth performing their diurnal revolution with greater velocity than the rest, a larger circle being described in the same time, the waters thereabout, from the stronger centrifugal force, may be supposed more buoyant; to feel less restraint from the sluggish principle of matter; to have less gravity; and therefore to be more obedient to external impulses of every kind, whether from the winds or any other cause.

SURFACE. See SUPERFICIES.

SURFEIT, in *Medicine*, a sickness with a sensation of a load at the stomach, usually proceeding from some error in diet, either with regard to the quantity or quality of the food taken. Sometimes, however, a surfeit is only a plethora from indolence and full diet: in which case perspiration is defective; and eruptions appear on the skin.

Fasting for some time, and an attention to temperance afterwards, with some brisk purgatives, will generally remove the effects of a surfeit, when it is unaccompanied with other more permanent affections.

SURFEIT, in *Farriery*. See FARRIERY *Index*.

SURGE, in the sea-language, the same with a wave. See WAVE.

SURGEON, or CHIRURGEON, one that professes the art of SURGERY.

In England there are two distinct companies of surgeons now occupying the science or faculty of surgery; the one company called *barbers*, the other *surgeons*, which latter are not incorporated.—The two are united to sue, and be sued, by the names of masters or governors and commonalty of the mystery of barbers and surgeons of London. 32 Hen. VIII. c. 42.

No person using any barbery or shaving in London, shall occupy any surgery, letting of blood, or other matter; drawing of teeth only excepted. And no person using the mystery or craft of surgery shall occupy or exercise the feat or craft of barbery or shaving, neither by himself, nor any other for his use. 32 Hen. VIII. c. 42.

By the same statute, surgeons are obliged to have signs at their doors.

The French chirurgeons being refused to be admitted into the universities (notwithstanding that their art makes a branch of medicine), on pretence of its bordering a little on butchery or cruelty, associated themselves into a brotherhood, under the protection of S. Cosmus and S. Damian: on which account, according to the laws of their institution, they are obliged to dress and look to wounds *gratis* the first Monday of each month.

They distinguish between a chirurgeon of the long robe and a barber-chirurgeon. The first has studied physic, and is allowed to wear a gown. The skill of the other, besides what relates to the management of the beard, is supposed to be confined to the more simple and easy operations in chirurgery; as bleeding, tooth-drawing, &c.

They were formerly distinguished by badges: those of the long gown bore a case of instruments; the barber, a bason.

SURGERY.

THE term surgery has been usually employed to signify that part of medicine which treats of the diseases of the human body which are to be cured or alleviated by the hand, by instruments, or by external applications.

INTRODUCTION.

MEDICINE and surgery, formerly regarded as one and the same science, were exercised by the same persons during the most remote ages; and their separation, such as now generally exists, is to be considered as a modern institution. If we consider their origin and end, the knowledge which the practitioner of each requires, and the connection which naturally subsists between the diseases which are supposed peculiarly to belong to each department, it is probable that the first practitioners confounded them with one another; and it is easy to conceive how the same ideas should have passed from one generation to another. At last, however, the knowledge of the healing art being greatly enlarged, it became necessary to separate it into different classes, and to form it into distinct departments in practice. Accordingly there were not only some who confined themselves to surgery, but there were lithotomists, phlebotomists, oculists, aurists, dentists, &c.

We do not propose here to enter into any detail in attempting to show how this separation was made, and still less to make mention of the puerile disputes regarding the pre-eminence of medicine to surgery. There are

Introduction.

are few we believe who in our days do not feel that such a pre-eminence does not exist in nature; that medicine and surgery are one and the same science; that they are coeval with the human race; and to those who are able to appreciate them, they must appear of equal utility and importance. The healing art is one, its principles ought to be the same throughout, and the exercise of its different branches supposes the same fundamental knowledge; but it offers in the detail such a vast field for study, that few men are able to embrace the whole, and to cultivate all the parts with equal success. It becomes, therefore, an advantage to society that such parts as can be easily separated in practice be exercised by different individuals; and that a man who has acquired a general knowledge of the structure, functions, and diseases of the animal economy, practise in such departments as he finds his talents and acquirements point out.

Some have opposed surgery to medicine by qualifying the first with the name of art, and in giving to the second that of science. To pretend that surgery is nothing but the art of treating diseases by external means or by manual operations, is to rank it among the mechanical professions; and to consider as a good surgeon, the man who can dress an ulcer, apply a bandage, reduce a fracture, amputate a limb, or perform such like operations, on the living body. We have already mentioned that the healing art is the same in all its branches; the internal organs of the body in a state of health are governed by the same general laws, and many of them are analogous in structure to the external parts; and the nature of a local disease can never be understood if we are not acquainted with all the deviations from the natural state, of which the whole animal system is susceptible. If a physician be called to treat a pleurisy, he cannot expect to do it with success unless he have a sufficiently clear idea of the nature of inflammation, or at least of the principal symptoms which characterise it; of its consequences, and of the proper mode of applying the means to remove it. This knowledge is not less necessary to the surgeon who is called to treat an wound, the management of which depends chiefly on the precautions necessary to prevent and remove inflammation in the affected parts, without at the same time weakening too much the vital powers. The knowledge of the physician does not merit more the name of *science*, than that of the surgeon who is well acquainted with the functions of the animal economy, with morbid structure, and with the progress and termination of diseases.

The student of surgery has therefore to acquire, not only all that knowledge necessary for the well educated physician, but he has likewise to learn the manner of performing surgical operations. This, though no doubt an essential requisite to the surgeon, is by no means so important as a competent knowledge of those diseases and states of disease which require such means; and the young surgeon should endeavour not to cherish that love of operating which is observed in some, and which arises from the eclât which a dexterous operator generally receives.

To become an intelligent and expert operator, several qualifications are necessary; and some of these fall to the lot of few individuals. There are many people, who, though they have acquired an extensive knowledge of diseases, have not that calmness of mind, that collectedness of thought, which is necessary for a good operator; and there are some who are even deficient in that mechanical dexterity, which, though not requisite in all, is yet necessary in several of the operations in surgery. These talents, however, are never given in such perfection as not to require cultivation. An early habit of being present, and of assisting at operations, prepares the student to act for himself; and a long and unremitting habit of using the knife, and of performing operations on the dead body, gives a facility in all the mechanical part of them, which even experience on the living body does not procure.

History of Surgery.

1 That surgery was coeval with the other branches of medicine, or perhaps antecedent to any of them, will not admit of doubt. The wars and contentions which have taken place among mankind almost ever since their creation, necessarily imply that there would be occasion for surgeons at a very early period; and probably external injuries would for some time be the only diseases for which a cure would be attempted, or perhaps thought practicable. In the sacred writings we find much mention of balsams, particularly the balm of Gilead, as excellent in the cure of wounds; though at the same time we are informed that there were some wounds which this balsam could not heal.

2 Concerning the surgery practised among the Egyptians, Jews, and Asiatic nations, we know little. The art descended from the Greeks to us, though they confessedly received it from the eastern nations. The first Greek surgeons on record are Æsculapius and his sons Podalirius and Machaon. Æsculapius flourished about 50 years before the Trojan war; and his two sons distinguished themselves in that war both by their valour and by their skill in curing wounds. This indeed is the whole of the medical skill attributed to them by Homer; for in the plague which broken out in the Grecian camp, he does not mention their being at all consulted. Nay, what is still more strange, though he sometimes mentions his heroes having their bones broke, he never takes notice of their being reduced or cured by any other than supernatural means; as in the case of Æneas, whose thigh-bone was broken by a stone cast at him by Diomed. The methods which these two famous surgeons used in curing the wounds of their fellow soldiers, seems to have been the extracting or cutting out the darts which inflicted them, and applying emollient fomentations or styptics to them when necessary: and to these they undoubtedly attributed much more virtue than they could possibly possess; as appears from the following lines, where Homer describes Eurypylus as wounded and under the hands of Patroclus, who would certainly practise according to the directions of the surgeons.

> Patroclus cut the forky steel away;
> Then in his hand a bitter root he bruis'd,
> The wound he wash'd, the styptic juice infus'd.
> The *closing flesh* that instant ceas'd to glow;
> The wound to torture, and the blood to flow.

3 Till the days of Hippocrates we know very little of what was the practice of the Greek surgeons. From him, however, we learn, that the practice of blood-letting, cupping, and scarification, was known to them; al-

History.

ſo the uſe of warm and emollient fomentations, iſſues made with hot irons, peſſaries, injections, fumigations, &c. Hippocrates alſo gives directions with regard to fractures, luxations, ulcers, fiſtulas. He directs the extenſion, reduction, bandages, and ſplints, proper to be uſed in fractures and luxations of different bones, with ſeveral machines to increaſe the extenſion when neceſſary. He directs the laxity and tightneſs of the bandages; the intervals for unlooſing and binding them on again; the poſition and repoſe of the fractured member, and the proper regimen; and he mentions the time when a callus is uſually formed. He treats alſo of fractures of the ſkull, and the method of applying the trepan. In his treatment of ulcers, he ſpeaks of reducing fungous fleſh by means of eſcharotics, ſome of which are alum, nitre, verdigriſe, quicklime, &c.

4 Surgery appears not to have exiſted in Rome, notwithſtanding the warlike genius of the people, for more than 500 years. Archagathus, a Greek, was the firſt profeſſor of the art in that city; and ſo frequently employed the knife, hot irons, and other cruel methods of cure, that he was branded with the opprobrious title of *carnifex*, and expelled the city, where no phyſician or ſurgeon of eminence again made his appearance for 180 years. At this time Aſclepiades undertook the profeſſion of medicine; but ſeems to have dealt little in ſurgery. Neither have we any thing of importance on that ſubject till the time of Celſus, who flouriſhed during the reigns of Auguſtus and Tiberius.—In his work on ſurgery, all the improvements from Hippocrates to his own days are collected; the moſt minute and trifling diſeaſes are not omitted. An eminent ſurgeon, of the moderns, emphatically exhorts every perſon in that profeſſion "to keep Celſus in his hands by day and by night." He deſcribes the ſigns of a fractured ſkull, the method of examining for the fracture, of laying the ſkull bare by an inciſion in the form of the letter X, and afterwards of cutting away the angles, and of applying the trepan, mentioning alſo the ſigns of danger and of recovery. He obſerved, that ſometimes, though very rarely, a fatal concuſſion of the brain might happen from the blood-veſſels within the ſkull being burſt, the bone remaining entire. After the operation of the trepan, ſponges and cloths wetted with vinegar, and ſeveral other applications, were made to the head; and, throughout, ſevere abſtinence was enjoined. In violent fractures of the ribs, he ordered veneſection; low diet; to guard againſt all agitation of the mind, loud ſpeaking, motion, and every thing that might excite coughing or ſneezing. Cloths wetted with wine, roſes and oil, and other applications, were laid over the fracture. The cure of fractures, in the upper and lower extremities, he ſaid were nearly alike; that fractures differ in degree of violence and danger, in being ſimple or compound, that is, with or without a wound of the fleſh, and in being near to the joint. He directs the extenſion of the member by aſſiſtants; the reduction, by the ſurgeon's hands, of the fractured bones into their natural ſituation; and to bind the fractured part with bandages of different lengths, previouſly dipped in wine and oil: on the third day freſh bandages are to be applied, and the fractured member fomented with warm vapour, eſpecially during the inflammation. Splints, if neceſſary, are to be applied, to retain the bones in a fixed poſition. The fractured arm is to be ſuſpended in a broad ſling hung round the neck: the fractured leg is to be inclofed in a kind of caſe, reaching above the ham, and accommodated likewiſe with a ſupport to the foot, and with ſtraps at the ſide, to keep the leg ſteady: in the fractured thigh-bone, the caſe is to extend from the top of the hip to the foot. He deſcribes the method of treating compound fractures, and of removing ſmall fragments of ſplinters of bones; and the manner of extracting darts. In luxations of the ſhoulder, he mentions ſeveral methods of giving force to the extenſion, and of replacing the diſlocated bone. One method ſimilar to that of Hippocrates was, to ſuſpend the patient by the arm; the fore part of the ſhoulder, at the ſame time, reſting upon the top of a door, or any other ſuch firm fulcrum. Another method was to lay the patient ſupine, ſome aſſiſtants retaining the body in a fixed poſition, and others extending the arm in the contrary direction; the ſurgeon, in the mean time, attempting, by his hands, forcibly to reduce the bone into its former place.

If a large inflammation was expected to enſue after a wound, it was ſuffered to bleed for ſome time, and blood was drawn from the arm. To wounds accompanied with conſiderable hæmorrhagy, he applied a ſponge wet in vinegar, and conſtant preſſure: If neceſſary, on account of the violence of the hæmorrhagy, ligatures were made round the veſſels, and ſometimes the bleeding orifice was ſeared up with the point of a hot iron. On the third day freſh dreſſings were applied. In conſiderable contuſions, with a ſmall wound of the fleſh, if neither blood-veſſels nor nerves prevented, the wound was to be enlarged. Abſtinence and low diet, upon all ſuch accidents, were preſcribed; cloths wet with vinegar, and ſeveral other applications, were to be applied to the inflamed part. He obſerves, that freſh wounds may be healed without compound applications. In external gangrene, he cut into the ſound fleſh; and when the diſeaſe, in ſpite of every effort, ſpread, he adviſed amputation of the member. After cutting to the bone, the fleſh was then ſeparated from it, and drawn back, in order to ſave as much fleſh as poſſible to cover the extremity of the bone. Celſus, though extremely diffuſe in the deſcription of ſurgical diſeaſes, and of various remedies and external applications, treats ſlightly of the method of amputating; from which, comparing his treatiſe with the modern ſyſtems, we might infer that the operation was then ſeldomer practiſed than at preſent. He deſcribes the ſymptoms of that dangerous inflammation the carbuncle, and directs, immediately to burn or corrode the gangrened part. To promote the ſuppuration of abſceſſes, he orders poultices of barley-meal, or of marſhmallows, or the ſeeds of linſeed and fenugreek. He alſo mentions the compoſitions of ſeveral repellent cataplaſms. In the *eryſipelas*, he applies ceruſe, mixed with the juice of ſolanum or nightſhade. Sal ammoniac was ſometimes mixed with his plaſters.

He is very minute in deſcribing diſeaſes of the eyes, ears, and teeth, and in preſcribing a multitude of remedies and applications. In inflammation of the eyes, he enjoined abſtinence and low diet, reſt, and a dark room: if the inflammation was violent, with great pain, he ordered veneſection, and a purgative; a ſmall poultice of fine flower, ſaffron, and the white of an egg, to be laid to the forehead to ſuppreſs the flow of pituita; the

History.

the ſoft inſide of warm wheat bread dipped in wine, to be laid to the eye; poppy and roſes were alſo added to his collyriums, and various ingredients too tedious to enumerate. In chronic watery defluxions of the eyes, he applied aſtringents, cupped the temples, and burnt the veins over the temple and forehead. He couched cataracts by depreſſing the cryſtalline lens to the bottom of the orbit. Teeth, looſened by any accident, he directs, after the example of Hippocrates, to be faſtened with a gold thread to thoſe adjoining on each ſide. Previous to drawing a tooth, he ordered the gum to be cut round its neck; and if the tooth was hollow, it was to be filled with lead before extraction, to prevent its breaking by the forceps. He deſcribes not only the inflammation, but likewiſe the elongation, of the uvula: he alſo deſcribes the polypus, and ſome other diſeaſes affecting the noſe.

He deſcribes ſeveral ſpecies of herniæ or rupture, and the manual aſſiſtance required in thoſe complaints. After the return of the inteſtines into the abdomen, a firm compreſs was applied to that part of the groin through which they protruded, and was ſecured by a bandage round the loins. In ſome caſes, after the return of inteſtinal ruptures, he diminiſhed the quantity of looſe ſkin, and formed a cicatrix, ſo as to contract over the part, to render it more rigid and capable of reſiſting. He deſcribes various diſeaſes of the genital parts, the hydrocele or dropſy of the ſcrotum, a difficulty of urine, and the manner of drawing off the water by a catheter; the ſigns of ſtone in the bladder, and the method of ſounding or feeling for that ſtone. Lithotomy was at that time performed by introducing two fingers into the anus; the ſtone was then preſſed forward to the perinæum, and a cut made into the bladder; and by the finger or by a ſcoop the ſtone was extracted. He deſcribes the manner of performing this operation on both the ſexes, of treating the patient, and the ſigns of recovery and of danger.

Celſus directed various corroſive applications and injections to fiſtulas; and, in the laſt extremity, opened them to the bottom with a knife, cutting upon a grooved inſtrument or conductor. In old callous ulcers, he made a new wound, by either cutting away the hard edges, or corroding them with verdigriſe, quicklime, alum, nitre, and with ſome vegetable eſcharotics. He mentions the ſymptoms of caries in the bone; directs the bone to be laid bare, and to be pierced with ſeveral holes, or to be burnt or raſped, in order to promote an exfoliation of the corrupted part; afterwards to apply nitre and ſeveral other ingredients. One of his applications to a cancer was auripigmentum or arſenic. He directs the manner of tapping the abdomen in aſcites, and of drawing blood by the lancet and cupping-glaſſes. His cupping-glaſſes ſeem not to have been ſo convenient as the modern: they were made either of braſs or horn, and were unprovided with a pump. He cured varicoſe veins by uſtion or by inciſion. He gives directions for extracting the dead fœtus from the womb, in whatever poſition it ſhould preſent; and, after delivery, to apply to the private parts ſoft cloths wet in an infuſion of vinegar and roſes. In Celſus's works there is a great redundance and ſuperfluity of plaſters, ointments, eſcharotics, collyriums, of ſuppurating and diſcutient cataplaſms, and external applications of every kind, both ſimple and compound: Perhaps, amongſt the multitude, there are a few uſeful remedies now laid aſide and neglected.

The laſt writer of conſequence who flouriſhed at Rome was Galen, phyſician to the emperor Marcus Aurelius. His works are for the moſt part purely medical; although he wrote alſo on ſurgery, and made Commentaries on the Surgery of Hippocrates. He opened the jugular veins and performed arteriotomy at the temples; directed leeches, ſcarification, and cupping-glaſſes, to draw blood. He alſo deſcribed with accuracy the different ſpecies of herniæ or ruptures.

In the year 500 flouriſhed Aëtius, in whoſe works we meet with many obſervations omitted by Celſus and Galen, particularly on the ſurgical operations, the diſeaſes of women, the cauſes of difficult labours, and modes of delivery. He alſo takes notice of the dracunculus, or Guinea worm. Aëtius, however, is greatly excelled by Paulus Egineta, who flouriſhed in 640; whoſe treatiſe on ſurgery is ſuperior to that of all the other ancients. He directs how to extract darts; to perform the operation ſometimes required in dangerous caſes of rupture or hernia. He treats alſo of aneuriſm. Galen, Paulus, and all the ancients, ſpeak only of one ſpecies of aneuriſm, and define it to be "a tumor ariſing from arterial blood extravaſated from a ruptured artery." The aneuriſm from a dilatation of the artery is a diſcovery of the moderns. In violent inflammations of the throat, where immediate danger of ſuffocation was threatened, Paulus performed the operation of bronchotomy. In obſtinate defluxions upon the eyes, he opened the jugular veins. He deſcribes the manner of opening the arteries behind the ears in chronic pains of the head. He wrote alſo upon midwifery. Fabricius ab Aquapendente, a celebrated ſurgeon of the 16th century, has followed Celſus and Paulus as text books.

From the time of Paulus Egineta to the year 900, no writer of any conſequence, either on medicine or ſurgery, appeared. At this time the Arabian phyſicians Rhazes and Avicenna revived in the eaſt the medical art, which, as well as others, was almoſt entirely extinguiſhed in the weſt. Avicenna's *Canon Medicinæ*, or General Syſtem of Medicine and Surgery, was for many ages celebrated through all the ſchools of phyſic. It was principally compiled from the writings of Galen and Rhazes. The latter had correctly deſcribed the ſpina ventoſa, accompanied with an enlargement of the bone, caries, and acute pain. In difficult labours, he recommends the fillet to aſſiſt in the extraction of the fœtus; and for the ſame purpoſe, Avicenna recommends the forceps. He deſcribes the compoſition of ſeveral coſmetics to poliſh the ſkin, and make the hair grow, or fall off.

Notwithſtanding this, however, it was not till the time of Albucaſis that ſurgery came into repute among the Arabians. Rhazes complains of their groſs ignorance, and that the manual operations were performed by the phyſicians ſervants. Albucaſis enumerates a tremendous liſt of operations, ſufficient to fill us with horror. The hot iron and cauteries were favourite remedies of the Arabians; and, in inveterate pains, they repoſed, like the Egyptians and eaſtern Aſiatics, great confidence in burning the part. He deſcribes accurately the manner of tapping in aſcites; mentions ſeveral kinds of inſtruments for drawing blood; and has left a more ample and correct delineation of ſurgical inſtru-

History.

ments than any of the ancients. He gives various obſtetrical directions for extracting the fœtus in caſes of difficult labour. He mentions the bronchocele, or prominent tumor on the neck, which, he tells us, was moſt frequent among the female ſex. We are alſo informed by this writer, that the delicacy of the Arabian women did not permit male ſurgeons to perform lithotomy on females; but when neceſſary, it was executed by one of their own ſex.

From the 11th century to the middle of the 14th, the hiſtory of ſurgery affords nothing remarkable except the importation of that nauſeous diſeaſe the leproſy into Europe. Towards the end of the 15th century the venereal diſeaſe is ſaid to have been imported from America by the firſt diſcoverers of that continent.

At the beginning of the 16th century, ſurgery was held in contempt in this iſland, and was practiſed indiſcriminately by barbers, farriers, and ſow-gelders. Barbers and ſurgeons continued, for 200 years after, to be incorporated in one company both in London and Paris. In Holland and ſome parts of Germany, even at this day, barbers exerciſe the razor and lancet alternately.

It is within the laſt three centuries that we have any conſiderable improvement in ſurgery; nor do we know of any eminent Britiſh ſurgical writers until within the laſt 130 years. "In Germany (ſays Heiſter) all the different ſurgical operations, at the beginning even of the 18th century, were left to empirics; while regular practitioners were contented to cure a wound, open a vein or an abſceſs, return a fractured or luxated bone; but they ſeldom or never ventured to perform any of the difficult operations." He alſo ſpeaks of their groſs ignorance of the Latin language.

6 Sixteenth century.

The firſt ſurgical work of the 16th century worthy of notice is that of J. Carpus. F. ab Aquapendente, an Italian, publiſhed a Syſtem of Surgery, containing a deſcription of the various diſeaſes, accidents, and operations. Boerhaave pays this author the following compliment: *Ille ſuperavit omnes, et nemo illi hanc diſputat gloriam; omnibus potius quam hocce carere peſſumus.* About the ſame period, A. Parey, a Frenchman, made ſeveral important additions to ſurgery, particularly in his collection of caſes of wounds, fractures, and other accidents which occur during war. The ancients, who were ignorant of powder and fire-arms, are defective in this part of military ſurgery. Parey pretends to have firſt invented the method of tying with a needle and ſtrong ſilk-thread waxed the extremities of large arteries, after the amputation of a member. The ligature of the blood-veſſels is, however, merely a revival of the ancient practice, which had fallen into diſuſe: Throughout the dark ages, the hot iron, cauteries, and ſtrong aſtringents, were ſubſtituted in its place. B. Maggius and L. Botellus wrote on the cure of gunſhot wounds. J. A. Cruce wrote a ſyſtem of ſurgery.

In the 17th century, ſurgery was enriched with ſeveral ſyſtems, and with detached or miſcellaneous obſervations. The principal authors are, M. A. Severinus, V. Vidius, R. Wiſeman, Le Clerc, J. Scultetus, J. Mangetus, C. Magatus, Spigellius, F. Hildanus, T. Bartholin, P. de Marchett.

7 Eighteenth century.

During the laſt century, ſurgery, like all the other ſciences, made more rapid progreſs toward perfection, than during all the preceding periods. This partly aroſe from the aſſiſtance of governments in the different countries. They being convinced that anatomy is one of the moſt neceſſary ſciences, and the groundwork of the whole healing art, but particularly of ſurgery, in many great cities academies were inſtituted for the cultivation of practical anatomy; and ſchools were alſo eſtabliſhed for the inſtruction of the theoretical and practical parts of ſurgery.

History.

Theſe improvements in ſurgery have been chiefly made in England, France, and Germany; and in all theſe countries a number of very eminent men have appeared.

The Engliſh ſurgeons, beſides poſſeſſing an accurate knowledge of anatomy, and great abilities in the operative part of their profeſſion, were the firſt who endeavoured to bring the art to its preſent ſimplicity. They directed alſo their attention, in a particular manner, to the diet of patients; the neglect of which had cauſed the unfortunate iſſue of many operations which had been dexterouſly performed.

Among the ſurgeons of later times, we may firſt mention the name of *Sharp*. He was a ſcholar of Cheſſelden, and one of the beſt ſurgeons of his day. He wrote a Compendium of Surgical Operations, 1746; and alſo a Critical Inquiry into the State of Surgery; both of which works are ſtill in high eſtimation.

In the year 1719, *Dr Monro*, after viſiting the ſchools of London, Paris, and Leyden, where he was a pupil of the great Boerhaave, came to Edinburgh; and this may be conſidered as the date of the foundation of the Edinburgh medical ſchool. He began by giving lectures on anatomy and ſurgery, the firſt which were delivered in Edinburgh; and in the year 1721 he was appointed profeſſor of anatomy and ſurgery to the univerſity. This eminent anatomiſt and ſurgeon, beſides filling his chair with the greateſt reputation, contributed to the advancement of our knowledge in many important parts of anatomy and ſurgery. His works, publiſhed by his ſon, beſides his Treatiſe on Oſteology, which is certainly the beſt deſcription of the bones that has ever been given, will be found to contain many intereſting and valuable obſervations on various ſurgical diſeaſes.

Joſeph Warner, ſurgeon of Guy's Hoſpital, in London, publiſhed his Caſes and Remarks in Surgery, in the year 1754, a work which contains many very important practical remarks. He afterwards publiſhed a very good work, containing a deſcription of the human eye and its adjacent parts, in which he particularly rejects the faſtening of the eye during the operation of cataract. He alſo publiſhed An Account of the Teſticles, their Common Coverings and Coats, &c.

Percival Pott, ſurgeon of St Bartholomew's Hoſpital, may be juſtly conſidered as one of the principal Engliſh ſurgeons of his time. He was not only a ſucceſsful practitioner, but an induſtrious and excellent writer. The merits of Pott are indeed conſiderable. He threw much light on the doctrine of wounds of the head, by his accurate arrangement of the different kinds of injuries to which the head is ſubject. He alſo gives a good account of hydrocele and the other diſeaſes of the teſticle. For the operation of the fiſtula in ano, he made material improvements. He has given many uſeful hints on fractures and diſlocations; and he was a great champion in favour of the operation for cataract by couching. He was the firſt perſon who deſcribed the chimney-

ſweeps

ſweeps cancer; and on herniæ, polypus, and curvatures of the ſpine, he has made many judicious pathological and practical obſervations.

Charles White, ſurgeon in Mancheſter, publiſhed an excellent practical work in the year 1770, in which he recommends amputation of the foot, a little above the ankle joint, inſtead of under the knee, as had uſually been practiſed. He alſo ſhows the effect of ſawing off the ends of bones; and diſcuſſes ſeveral other intereſting points in ſurgery. In the ſame year, Mr Elſe of St Thomas's Hoſpital, publiſhed his treatiſe on the hydrocele, in which he recommends the uſe of cauſtic in the cure of that diſeaſe.

In the year 1770, *Mr Deaſe*, of Dublin, wrote an excellent treatiſe on the wounds of the head. Mr Bromfield, of St George's Hoſpital, and Mr Hill, ſurgeon at Dumfries, alſo diſtinguiſhed themſelves; Mr Bromfield for his Chirurgical Obſervations, and Mr Hill for his Obſervations on Cancers.

In the year 1778, *Mr Benjamin Bell* publiſhed the firſt volume of his Syſtem of Surgery. The reputation of this work was ſoon ſuch, that it was tranſlated into the French and German languages; and it has ſince gone through ſeveral editions in theſe, and many in Engliſh.

This work preſented the moſt complete ſyſtem of ſurgery which had ever appeared; and in every part of it there is diſplayed a talent for practical obſervation and clearneſs of thought which muſt render it ever a uſeful and valuable preſent to ſurgery. Like all ſuch extenſive works, it is not without faults, and the language in which it is written is in ſome places prolix and diffuſe; but notwithſtanding its errors, it certainly muſt be conſidered as the moſt uſeful body of ſurgery that has ever yet appeared in this country.

Beſides theſe, mention muſt be made of two other eminent ſurgeons, *William* and *John Hunter*; the former rendered immortal by his ſplendid work on the gravid uterus, and the latter by his treatiſe on the venereal diſeaſe, and his treatiſe on the blood, inflammation, and gun-ſhot wounds.

Many very eminent men aroſe, both in France and Germany, during the laſt century. The tranſactions of their academies leave a laſting monument of their zeal and induſtry.

In France we have the names of Petit, Arnaud, Garangeot, Morand, Le Dran, Le Cat, Louis, David Levret, Le Blanc, De la Faye, David Chopart, Deſſault, Janin, Jourdain, Pouteau, André Lombard Wenſel.

In Germany, ſurgery has been enriched by the works of Vogel, Platner, Albert Haller, Bilguer, Weitz, Seibold, Brambilla, Theden, Smucker, Stork, Plenk, Iſenflamm, Rougemont, Conradi, and many others.

---

3 Arrangement of ſurgical diſeaſes.

Moſt authors who have written ſyſtems of ſurgery have deſcribed diſeaſes according to the parts of the body where they were ſituated; beginnning with the head, and deſcribing the parts in ſucceſſion, according to their ſituation.

Beſides this mode of arrangement being unphiloſophical, it has many ſerious diſadvantages. Diſeaſes which have no analogy to each other, are treated of in the ſame place; and ſimilar diſeaſes are treated of ſeparately, inſtead of being claſſed together, and conſidered in one general point of view. A repetition of what may be conſidered as the ſpecific characters of the diſeaſe, therefore, is conſtantly occurring. The utility of noſological ſyſtems in practical medicine and in pathology, has been very generally acknowledged. Diſeaſes which have common characters are thus brought together and are arranged under claſſes, orders, genera, and ſpecies. It is to be conſidered, therefore, as an important ſtep in order to facilitate the knowledge of the diſeaſes of the human body, and to give clear and diſtinct ideas of them; for it is equally important, to be able to diſtinguiſh diſeaſes, as to point out how they ſhould be treated.

All noſological writers have not, however, conſtructed their ſyſtems on ſimilar principles; and their efforts have been often fruſtrated by the falſe theories and hypotheſes with which they have ſet out.

The world is indebted to the ingenious and celebrated *Bichât*, for the firſt truly philoſophical view of the ſtructure of the human body. The ſimple diviſion of it into its component parts, which that great anatomiſt and philoſopher pointed out, muſt be conſidered as the groundwork of all future anatomical and pathological inquiries.

Bichât demonſtrated, that moſt of the organs of our body are made up of a variety of elementary parts or textures; each of which, in whatever part of the body it is found, uniformly has the ſame phyſical properties, and preſent the ſame morbid phænomena. Theſe he conſiders as the elementary parts; which, by the diverſity of their combinations, produce all the modifications of ſtructure and functions exhibited in the different organs of animals. This method of conſidering organized bodies, accords with every phænomenon with which we are acquainted, and ſeems to ariſe from the eſſential nature of their conſtitution. We may trace this view of the ſtructure of the body in the obſervations of many of the older anatomiſts; and particularly it may be conſidered as the baſis of ſome of the moſt ingenious philoſophical theories of the late ingenious Mr John Hunter.

In order to fix the characters of the elementary textures, Bichat employed various modes of inquiry. He performed numerous experiments on living animals; perſevered in tedious and minute diſſections; employed chemical reagents to ſupply the place of the knife; and examined with minuteneſs all the varieties of morbid ſtructure. Having by theſe means accompliſhed his object in tracing the character of each ſeparate texture, he proceeded next to inveſtigate their combinations as they are found in the different organs.

The effects of this mode of inveſtigating the ſtructure of the human body when diſeaſed, muſt be at once obvious. We learn from it, that diſeaſes at their commencement are generally confined to one texture of an organ; the other textures of which the organ is compoſed remaining ſound.

There is no organ of the body from which this important truth may not be deduced. It may be readily illuſtrated from conſidering the diſeaſes of the mucous, ſerous, and muſcular textures, which compoſe the ſtomach and alimentary canal; of the cellular texture of the lungs; of the mucous membrane of the bronchi, the ſerous one of the pleura, and many others.

But diſeaſes are not only confined to one individual texture of any organ, as in the caſes juſt mentioned; the ſymptoms and morbid changes are likewiſe uniformly the ſame in textures of a ſimilar ſtructure, in whatever parts.

History.

parts of the body these textures may happen to be found. Thus the serous membranes which invest the lungs, the brain, the heart, the abdominal viscera, have one common character when affected with any specific disease: so also have the mucous membranes, whether we trace them in the mouth, the nose, the vagina, the urethra, or covering the eye-ball; and the same may be observed of every individual texture which enters into the composition of our bodies.

Besides the symptoms and morbid changes which are common to all textures whose structure is similar in the natural state, there are others which are determined from the particular functions of the organ in which the diseased texture exists. For example, when any of the serous membranes are inflamed, the nature of the pain, the degree of fever, and the duration of the symptoms, are the same, in whichsoever one it may have taken place. But to these symptoms are added, cough, difficulty of breathing, &c. when it happens to be connected with the organs of respiration, as in the case of pleuritis; costiveness, strangury, delirium, loss of vision, when the intestines, the bladder, the brain, or the eye, are involved in the disease.

This view of the subject naturally suggests a correspondent division of the symptoms. The first class are general, and characterise a whole genus of textures; the second are in a manner accessory, and depend upon the relative situation or the particular functions of the organ into the composition of which the affected texture enters.

But here we must set bounds to this theory;—the history and progress of diseases shew, that we ought not to confine our observations within such narrow limits. The principles which have been stated, indeed, account admirably well for the propagation of some affections; and for some of the sympathies which subsist between different parts of the body; but there are other disorders which advance in a very different manner. In some diseases which are termed chronic, for example, the whole structure of an organ becomes gradually altered, although the primary affection was confined to one of its component textures. This is often to be observed in cancer, scrofula, lues venerea, &c. When cancer attacks the mamma, it is at its commencement generally confined to a small portion of that gland; but if allowed to proceed, it ultimately involves the whole gland, and the adjacent cellular and cutaneous textures, in one mass of disease.

These general observations will be sufficient to give an outline of the principles of a pathological system, founded on the basis of anatomical knowledge; and in giving an account of these diseases which more properly belong to a system of surgery, we have ventured to apply these principles. We shall, in the first place, therefore, consider the diseases of the cellular membrane; the diseases of the skin; of the mucous, serous, and sinovial membranes; of bone and cartilage; of the vascular and nervous systems; and of the glands. In the second place, we shall treat of diseases which occur only in particular organs, whether from the peculiarity of their structure or functions: such are the diseases of the eyes, ears, nose, teeth, mouth, and fauces, and the organs of urine and generation. In the third place, we shall take notice of malconformations, distortions, and protrusions; and in the last place, of wounds, fractures, dislocations, and such operations as are occasionally necessary to be performed on different parts of the body, as amputation, sutures, &c.

Chap. I.

Of the Diseases of the Cellular Membrane.

Sect. I. *General Remarks on the Pathology of the Cellular Membrane.*

The cellular membrane is distinguished from other organs, by the power which it has of throwing out granulations, by its being capable of elongation, of reproduction, and of growth when it has been divided or cut by any means *.

Suppuration also takes place in the cellular membrane, with a rapidity of which we have few examples in other textures. The fluid which is the result of this suppuration, is well known. Its colour, its consistence, and all its external qualities, have become the criterion by which we form our ideas of *pus;* in consequence of which, all discharges which do not resemble it, have been commonly considered as pus of a bad kind, or as *sanies*. This opinion, however, is false; and has been formed in consequence of a too superficial view of the different circumstances attending different kinds of discharged fluids. Certainly the pus which is discharged from a bone, from a muscle, from the skin in erysipelas, from the mucous membranes in catarrh, is of a good kind whenever the inflammation runs through regularly its different periods, and notwithstanding it is quite different in all these cases from the pus produced by suppuration of the cellular membrane. As the latter is most frequently observed, from it we have formed an idea of *laudable* pus, and of *sanies*. The cutaneous pus, the mucous pus, the osseous pus, &c. have all their proper sanies; which differ from one another as much as the natural structure and functions of the organs from which they are produced.

There are few parts of the body which have a greater number of exhalents than the cellular membrane; and this exposes it to a number of alterations of structure, such as being preternaturally distended by the different substances which it exhales; these presenting a solid appearance, and sometimes producing a lardy substance, sometimes a gelatinous matter, and sometimes a much firmer and harder mass. The numerous absorbent vessels which are also distributed on the cellular membrane, is another cause of various diseases; every small cell being a reservoir common to the exhalents which terminate in it, and to the absorbents which arise from it.

There are some diseases, too, which produce a change in the elasticity and powers of distension, which the cellular membrane naturally possesses. In health it has enormous powers of distension, as may be observed in emphysema and in anasarca; and whenever these causes are removed, it regains its natural bulk and form. In inflammations, this property is in part destroyed, and it happens also in many of the different indurations to which it is liable. Its elasticity is also less remarkable in people advanced in life, than in children. When an old man becomes rapidly thin, the skin becomes flacid, and formed

* Bichat Anatomie Descriptive.

Of the Pathology of the Cellular Membrane.

formed into many folds; but when a young man is emaciated, the skin is applied exactly to the subjacent organ, and preserves its tension.

The cellular membrane, when diseased, becomes sometimes extremely sensible, and the seat of acute pain, though it seems to possess no sensibility in its natural state. When either blood, milk, or lymph, are effused in it, its sensibility is not altered, and these fluids are absorbed. On the contrary, the sensibility is so much altered by the contact of urine, of bile, of saliva, and of the other fluids destined to be thrown out of the body, that often the inflammation which succeeds the effusion prevents their absorption.

As the cellular membrane enters into the composition of every organ, it is often difficult to distinguish in diseases what belongs to it from what is the attribute of the parts with which it is found. These connections, however, become manifest under several circumstances: in acute and chronic diseases it is very susceptible of being influenced by the disease of the organs. We do not speak here of the alterations produced from juxtaposition and continuity, but of those which arise in parts of the cellular membrane which have no known connection with the affected organ.

In acute diseases which affect a particular organ, as the lungs, stomach, intestines, &c. often the cellular membrane becomes sympathetically affected and the seat of inflammation and abscesses, &c. The greater number of critical abscesses arise from this connection which exists between the organ affected and the cellular membrane. In acute diseases too it is commonly the function of exhalation or absorption of the cellular membrane that is affected, and hence the sudden œdema which often accompanies them. In chronic diseases their influence is no less remarkable. It is well known, that in chronic diseases of the heart, of the lungs, of the liver, of the stomach, kidneys, uterus, &c. they have for their symptom during their last stages an anasarca, more or less general, which arises from a debility produced in the cellular system.

We observe, that in all acute diseases, the skin receives with great facility the sympathetic influence of the diseased organ, and that it is alternately moist and dry frequently during the same day. It is by no means improbable that the cellular membrane undergoes alterations analogous to those of the skin; and if we could observe what passes in it, we would discover the cells more or less moist, more or less dry, according as it happened to be influenced: it is also to this that we ought to attribute the different state of the cellular membrane, in patients who have died of acute diseases; these presenting numberless varieties in the serous effusions.

The cellular system is not only influenced by its sympathy with other organs; but it also exercises a sympathy over them. In a phlegmon or inflammation of the cellular membrane, if the tumour is considerable, often various alterations take place in the functions of the brain, of the heart, of the liver, or of the stomach. The sympathetic vomiting, &c. are those phenomena in great phlegmons which are often manifested without being considered as belonging to the disease.

Art avails itself of the influence of the cellular system being affected by other organs, in the use of *setons*. Often in the diseases of the eye and of joints a seton produces an effect which cannot be obtained by a blister; and this probably arises from the connection which exists between the cellular membrane and the eye, being more active than that which exists between that organ and the skin *.

Of the Pathology of the Cellular Membrane.

* Vide *Anatomie Descriptive, par Bichat.*

It ought also to be remarked, in considering the pathology of the cellular system, that there is a manifest difference in the properties of the cellular texture, which is composed of layers and filaments; and in that found exterior to the different mucous surfaces, to the blood-vessels and excretories, which consists of filaments alone. From this difference results the rare occurrence of inflammations and of different kinds of tumors in the latter. It often forms a barrier where the morbid affection of the former stops, and thus protects the organ which it envelopes.

The unfrequency of hemorrhagy when extensive suppurations have laid bare large arteries is a proof of what has been said. We have seen cases where the cellular membrane contiguous to the brachial and femoral arteries has been completely ulcerated, whilst the coats of the arteries remained sound. We have observed the same phenomenon in the urethra and in the intestines. In cases of suppuration of the prostate gland and cavernous bodies of the urethra, the canal has remained untouched; and in a case of femoral hernia, where the hernial sac, and the cellular membrane covering it, all mortified, the protruded gut remained quite sound.

The cellular membrane has also a powerful influence in the production of a variety of tumors and excrescences, forming as it were their base or parenchyma of nutrition. Encysted tumors are met with alone in the cellular texture of different parts of the body, and various kinds of solid tumors and excrescences are formed by the growth of that texture on the part where the tumor is to be developed; afterwards different substances are deposited amongst it, the difference in the nature of which constitutes the difference in the tumors.

These remarks will be sufficient to give a general view of the pathology of the cellular membrane, and will enable us to form a more comprehensive and connected view of those diseases, which may be more properly considered as coming within the province of surgery.

The diseases of the cellular membrane which we shall treat of in this chapter are, 1. Inflammation of the cellular membrane, or phlegmon. 2. Panaris or whitloe. 3. Sinuses. 4. Carbuncle. 5. Encysted tumors. 6. Steatom. 7. Sarcoma. 8. Œdema. And, 9. Emphysema.

Sect. II. *Of Phlegmon.*

10

In most accounts which surgical authors have given of *inflammation*, they have taken the description of its general phenomena from inflammation of the cellular membrane.

Inflammation of the cellular membrane, or phlegmon, is characterized by a tumor more or less elevated and circumscribed, visible or not visible, according to the part where it is situated. It is always accompanied with an increased sensibility of the part, and with a lancinating or beating pain, a degree of heat, greater than natural, a bright redness, which becomes more livid as the disease advances, an elevated point; and it gradually

Of Phlegmon.

ly turns ſofter from the center to one part of the circumference.

Theſe are the ſymptoms which are generally to be obſerved more or leſs remarkable in every ſpecies of phlegmon. When they are ſlight, and when the affected part is not extenſive, or very important from the nature of its functions, it generally has not much influence on the general ſyſtem. But when they are more conſiderable, and the inflammation extends far, the pulſe becomes commonly full, frequent, and hard; at the ſame time, the patient complains of univerſal heat, thirſt, and other febrile ſymptoms.

When by the efforts of nature, or by the application of proper remedies, the pain, the heat, and the tenſion go away, the other ſymptoms, which depend in a great degree or altogether on the firſt which have been mentioned, diſappear alſo, and the patient quickly recovers his health. This termination, which is commonly the the moſt deſirable, is called *reſolution*.

But if, notwithſtanding the remedies uſed, the different ſymptoms augment inſtead of diminiſhing, the tumor gradually increaſes in ſize and turns ſoft. A ſmall eminence is obſerved towards the centre of the tumor or at ſome particular point, and its ſurface becomes poliſhed. Soon afterwards the pain diminiſhes, and the febrile ſymptoms abate; and on compreſſing the tumor, the fluctuation of a fluid can be perceived in it, and this conſtitutes the ſecond termination of a phlegmon, or *abſceſs*.

11 *Of the treatment of Phlegmon.*—The principal object which is to be generally kept in view in the treatment of inflammatory tumors, is to obtain their reſolution; this being the moſt prompt and moſt certain mode of cure. There are, however, ſome caſes which are an exception to this general rule; ſuch as ſome inflammatory tumors which precede fevers, and other internal diſeaſes: for it is commonly ſuppoſed that in theſe caſes, ſuppuration is a mode by which nature throws off certain fluids or humours, which are pernicious to remain in the ſyſtem. There are other tumors which ſeem to ariſe from internal cauſes, where it is perhaps better neither to attempt to accelerate their ſuppuration nor reſolution, but to truſt them entirely to nature. Such are inflammatory tumors which occur in ſcrofulous ſubjects. There are few caſes of this kind where ſuppuration ought to be promoted, for their treatment is always embarraſſing whether they are opened naturally or by art. It is well known too, that ſuch tumors often remain a long time without any danger; from whence we may conclude, that it is moſt prudent not to touch them.

In the venereal diſeaſe, we have a ſpecific for its cure; and when buboes are opened, or other inflammatory venereal ſwellings, they generally become very difficult and embarraſſing to treat. It is therefore always moſt prudent to attempt their reſolution.

The principal means to be employed, in order to procure the reſolution of an inflammatory tumor, are local and general blood-letting, the application of heat and moiſture, &c. Leeches is perhaps the beſt mode of bleeding the inflamed part; but ſhould the inflammation take place in any of the extremities, or contiguous to any of the large veins, one or other of theſe may be opened. There is no application which tends ſo much to remove the tenſion and pain of an inflamed part as the uſe of poultices or warm fomentations. Applications of a ſedative nature are recommended by many, ſuch as the different preparations of lead, the ſulphate of zinc, vinegar, &c.; but as far as we have been able to obſerve, the uſe of this claſs of medicines has by no means ſuch powerful effects as emollients, though it has been generally ſuppoſed that emollients haſten ſuppuration. In applying poultices, they ſhould generally be removed three or four times in twenty-four hours, and the part bathed with warm water each time the poultice is changed. When fomentations are to be uſed, many employ warm water alone, whilſt others prefer a decoction of chamomile flowers, or of poppy heads. A piece of flannel of conſiderable ſize, wet with either of theſe in nearly the boiling heat, is to be forcibly wrung out, and applied as warm as the patient can ſuffer it, to the inflamed part. A ſecond piece of flannel is to be prepared in the ſame manner, and whenever that which is firſt applied begins to cool, the ſecond piece is to be employed; and this practice is to be continued for ten or fifteen minutes, and repeated as often as it is found to relieve the patient. The beſt mode of applying the ſedative remedies in external inflammation, is in the form of watery ſolution. Half an ounce of the acetate of lead diſſolved in four ounces of vinegar, with the addition of two pounds of diſtilled water, is a convenient form. In making uſe of this ſolution, it is of conſequence to have the parts affected kept conſtantly moiſt, and cataplaſms prepared with it generally anſwer that intention exceedingly well. But when the inflamed part is ſo tender and painful, as not eaſily to bear the weight of a poultice, pieces of ſoft linen, moiſtened with the ſolution ſhould be employed. Both ſhould be applied cold, or at leaſt with no greater warmth than is merely neceſſary for preventing pain or uneaſineſs to the patient. They ſhould be kept conſtantly at the part, and always renewed before turning dry and ſtiff.

When the part affected with inflammation is not very tender, or lies deep, applications of vinegar are often had recourſe to with conſiderable advantage; and the moſt effectual form in uſing it, is in that of cataplaſm, made with the ſtrongeſt vinegar and crumb of bread. In ſuch caſes, the alternate uſe of this remedy, with the ſaturnine ſolution, has produced more beneficial effects than are commonly obſerved from a continued courſe of any one of them.

In all caſes of inflammation, the whole body, but more eſpecially the diſeaſed part, ſhould be preſerved as free as poſſible from every kind of motion, and the patient ſhould be confined to a low cooling diet, and alſo a total abſtinence from ſpirituous and fermented liquors.

In ſlight caſes of inflammation, a due perſeverance in the mode of treatment which has been mentioned, will be in general ſufficient to accompliſh the intended purpoſes; but when there is likewiſe a full, hard, and quick pulſe, with other ſymptoms of fever, general blood-letting becomes neceſſary; and the quantity of blood taken away is always to be determined by the extent and violence of the diſeaſe, and by the age and ſtrength of the patient. Evacuations, however, ſhould never be carried to a greater height than what is merely neceſſary for moderating the febrile ſymptoms; for ſhould ſuppuration take place after the ſyſtem is too much reduced, its progreſs becomes more ſlow and uncertain; nor

Of Phlegmon.

nor is the patient able to ſupport the diſcharge that enſues. The uſe of gentle laxatives, with a cooling diet, is alſo attended with very good effects.

Beſides theſe different evacuations, it is of great conſequence to procure eaſe and quietneſs to the patient. The moſt effectual remedy for this purpoſe is *opium*, and, when the pain and irritation are conſiderable, as in extenſive inflammations very frequently happens, it ſhould never be omitted. In all ſuch caſes, the opium ſhould be given in full doſes, otherwiſe, inſtead of proving ſerviceable, it ſeems rather to have the contrary effect, a circumſtance which is perhaps the chief reaſon for opiates having been by ſome very unjuſtly condemned in every caſe of inflammation.

By a proper attention to theſe different circumſtances, a reſolution of the tumor will generally begin to take place in the courſe of three or four days, and ſometimes in a ſhorter time; at leaſt before the end of that period, it may be for the moſt part known how the diſorder is to terminate. If the heat, pain, and redneſs, and other attendant circumſtances abate, and eſpecially if the tumor begins to decreaſe, it is probable that, by a continuance of the ſame plan, a total reſolution will be finally effected.

But, on the contrary, if all the different ſymptoms rather increaſe, and eſpecially if the tumor turns larger, and ſomewhat ſoft, with an increaſe of throbbing pain, we may with tolerable certainty conclude that ſuppuration will take place; and we ſhould therefore immediately deſiſt from ſuch applications as were judged proper while a cure was thought practicable by reſolution, and endeavour to aſſiſt nature as much as poſſible in the formation of pus, or what is called the *maturation* of the tumor. To effect this, nothing is more uſeful than warm fomentations and cataplaſms; and ſhould theſe not have been employed during the former ſtage, the cold ſaturnine applications ſhould be given up, and recourſe had to the emollient remedies.

Dry cupping, as it is termed, viz. uſing the cupping glaſſes without the ſcarificator, applied as near as poſſible to the part affected, is frequently had recourſe to in promoting the ſuppuration of tumors. It is only, however, in thoſe in which there ſeems to be a deficiency of inflammation, that it can ever be either neceſſary or uſeful; but in all tumors of an indolent nature, and where there is ſtill ſome probability of a ſuppuration, no remedy is more effectual. By theſe different applications, continued for a longer or ſhorter time, according to the ſize of the tumor, its ſituation and other circumſtances, a complete ſuppuration may generally be at laſt expected.

Whilſt an abſceſs is forming, it extends acccording as the quantity of purulent matter is augmented in the cavity in which it is contained; and this extenſion takes place towards that ſide where there is leaſt reſiſtance. It is on this account that where an abſceſs is deep, or covered by an aponeuroſis, it extends in the interſtices of the neighbouring parts, and diſſects, as it were, the tendons, the muſcles, and the bones, whilſt in common caſes it makes its way towards the ſkin. When matter is collected very near to the ſurface of the body, and is only covered by the common integuments, it ſpeedily makes its way externally; but when it is deep, and ſurrounded by parts which make great reſiſtance, purulent matter inſinuates itſelf until it arrives at ſome place where there is nothing to oppoſe its exit; and it is obſerved making its eſcape after having made, in ſome caſes, a very great circuit. It is generally towards the inferior parts of the body that purulent matter, in conſequence of its weight, makes its route. On this account we ſee large abſceſſes open themſelves moſt frequently at their inferior part, and from thence the advantage which is found by waiting till they open of themſelves, or that they indicate the place moſt convenient for the opening to be made. Thus, we ſee abſceſſes formed under the temporal muſcles open themſelves in the mouth, and thoſe of the loins making their appearance near the ring, or upon the anterior part of the thigh. Deep abſceſſes, in certain parts of the body, proceed rather towards the interior than towards the ſurface, becauſe the purulent matter finds leſs obſtruction in its paſſage. Thoſe, for example, which form on the ſurface of the lungs, find great reſiſtance from the ribs and other parts forming the thorax, whilſt they eaſily make their way through the ſpongy ſubſtance of the lungs, and open in the ramifications of the bronchiæ. For the ſame reaſon, abſceſſes formed in the cavity of the abdomen ſometimes diſcharge themſelves into the ſtomach or inteſtines; but as the parietes of the belly yield more eaſily than thoſe of the cheſt, we alſo ſee abſceſſes of the different organs contained in the belly, diſcharge their contents through its parietes.

When matter is fully formed in a tumor, a remiſſion of all the ſymptoms takes place. The throbbing pain, which before was frequent, now goes off, and the patient complains of a more dull, heavy, and conſtant pain. The tumor points at ſome particular part, generally near to its middle, where, if the matter be not deep ſeated, a whitiſh yellow appearance is obſerved, inſtead of the deep red that formerly took place; and a fluctuation of the fluid underneath is, upon preſſure, very evidently perceived. Sometimes, indeed, when the abſceſs is thick, and covered with muſcle and other parts, though from concurring circumſtances there can be little doubt of there being a very conſiderable collection of matter, yet the fluctuation cannot be readily diſtinguiſhed. It does not, however, often happen that matter is ſo very deeply lodged as not to be diſcovered on proper examination.

This, however, is a circumſtance of the greateſt conſequence in practice, and deſerves more attention than is commonly paid to it. In no part of the ſurgeon's ployment is experience in ſimilar caſes of greater uſe to him than in the preſent; and however ſimple it may appear, yet nothing more readily diſtinguiſhes a man of extenſive obſervation than his being able eaſily to detect deep-ſeated collections of matter; whilſt nothing, on the contrary, ſo materially affects the character of the ſurgeon as his having, in ſuch caſes, given an inaccurate or unjuſt prognoſis.

In addition to the ſeveral local ſymptoms of the preſence of pus already enumerated, may be mentioned the frequent ſhiverings to which patients are liable on its firſt formation. Theſe, however, ſeldom occur ſo as to be eaſily diſtinguiſhed, unleſs the collection is conſiderable; but it is a ſymptom conſtantly obſerved in all large abſceſſes; and when it takes place, along with other ſymptoms of ſuppuration, it always contributes to point out the true nature of the diſeaſe.

Of the opening of Abſceſſes.—When abſceſſes come to complete

Of Abſceſſes.

complete maturity, the integuments gradually become thinner over the more prominent part of the tumor; and they become ulcerated in one or more points through which the pus is evacuated. In many caſes it is adviſable to wait for the ſpontaneous rupture; but, on the other hand, it is often more prudent, and is indeed abſolutely neceſſary, ro give vent to the matter by an artificial opening. It is a general rule not to have recourſe to ſuch means before ſuppuration is completely formed; for if an abſceſs be opened before this period, and a conſiderable hardneſs remain around, the treatment afterwards becomes very embarraſſing and difficult. It is, however, neceſſary in ſome caſes to depart from this general rule, and to open an abſceſs much ſooner. Above all, thoſe which are critical, and thoſe which are the conſequence of lingering fevers.

In many caſes there is neither ſafety nor convenience to be expected from the ſpontaneous opening of the integuments. In abſceſſes ſituated in any of the joints, or upon either of the cavities of the breaſt or abdomen, and more eſpecially when they ſeem to run deep, they ſhould always be opened as ſoon as the leaſt fluctuation of matter can be diſcovered; for when the reſiſtance is on either ſide equal, it juſt as readily points inwardly towards the cavity, as outwardly towards the ſkin; and the conſequence of a large abſceſs burſting into either of the large cavities, moſt frequently proves fatal.

Abſceſſes are ſometimes formed about the face, which point externally, and theſe ſhould be opened in the inſide of the mouth, in order to prevent any deformity. Whenever the fluctuation is ſenſible, this ſhould be immediately done. They cicatriſe very rapidly, and require no dreſſings.

Abſceſſes confined under an aponeuroſis, and in general under thoſe parts which are not capable of being extended without much difficulty, ought to be opened early. Such are abſceſſes which are formed under the temporal muſcles or faſcia lata of the thigh, or thoſe which frequently happen in the extremity of the fingers, under the arch of the palate, round the maxillary bones, behind the ear, above the maſtoid proceſſes, &c. All theſe ought to be opened very ſpeedily, and in particular thoſe laſt mentioned, on account of the danger of a caries of the bone in which they lie being produced.

It is alſo particularly neceſſary to open without delay abſceſſes in the neighbourhood of the anus, or near the urethra. This ought alſo to be done in large abſceſſes of the extremities, and in particular thoſe which are the conſequence of violent inflammation, occupying the whole member, as the thigh, the arm, &c. If in ſuch caſes the matter be allowed to remain too long, the greater part of the cellular membrane is detached from the ſubjacent aponeuroſis, and there often follow large gangrenous ſloughs, which in ſeparating themſelves lay open extenſive ſurfaces, and often form large bags of pus, which become as many ſeparate abſceſſes; and often the diſorder is ſuch that the whole of the integuments of the member ſphacelate and fall off. It is alſo neceſſary not to delay the opening of abſceſſes formed among the large muſcles, the interſtices of which are filled up with cellular texture; ſuch are thoſe of the thigh, the back leg, and under the arm-pit. In theſe ſituations the matter is very apt to ſpread, and to form ramifications of the abſceſs in various directions, which, if not treated with much care, are very tedious to heal.

With the exception of thoſe caſes which have been mentioned, it ought to be obſerved as a general rule not to open an abſceſs until ſuppuration has completely formed; for if it be true, as it is ſaid, that pus is always ſufficiently prepared to be evacuated, it is alſo the caſe, that the more we favour its formation before giving it vent, the more we are ſure of diminiſhing and of reducing the hardneſſes which exiſt in the neighbourhood, and facilitating the cicatrization of the ulcer.

Of the different Methods of opening Abſceſſes.

There are three different modes of opening abſceſſes; viz. by cauſtic, inciſion, or ſeton. 13

1. *By Cauſtic.*—The uſe of cauſtic is recommended in caſes where ſuppuration has been ſlow, and has not occupied the whole tumor; in thoſe where the integuments have ſuffered much, and where it was neceſſary to wait long before opening it, on account of ſome affection of the bottom of the abſceſs; and in general in all caſes of the ſuppuration of glands.

But though there are circumſtances which may render it neceſſary to employ the cauſtic rather than the inciſion, yet the latter generally deſerves the preference. The pain which it occaſions laſts only a moment, whilſt that of cauſtic laſts many hours; and when the inflamed part has acquired a morbid degree of ſenſibility, the pain is very violent. The ſurgeon alſo can never limit preciſely the extent of the action of the cauſtic; and whatever attention be paid to it, it often extends too far, and penetrates too deep.

To open an abſceſs with cauſtic, an adheſive plaſter ſpread on leather is to be applied over the tumor, with a ſlit in it of a ſize ſomewhat leſs than what is intended to be made in the ſkin by the cauſtic. The ſlit is to be filled with the cauſtic reduced into powder, mixed with a ſmall quantity of ſoap, and wetted, ſo as to make it operate more quickly. Another adheſive plaſter is then to be laid over it, and the whole ſecured with a firm compreſs and bandage. The time neceſſary to allow the cauſtic to make a ſufficient opening will depend on the thickneſs of the ſkin and ſtrength of the cauſtic, but generally it requires two, three, or more hours. When the eſchar is made, and the matter has not eſcaped, we ought to aſſiſt its exit with the end of a probe, or the point of a biſtoury; and the ſeparation of the eſchar is to be promoted by emollient applications.

2. *By the Inciſion.*—The tumors which are not very extenſive, may generally be opened by making a longitudinal inciſion with the lancet, ſee Plate DXIII. fig. 1. For this purpoſe, when the ſituation of the abſceſs permits it, the ſurgeon is to apply one hand on the baſe of the tumor, and preſs the pus towards the ſkin, by doing which there is no riſk of wounding any artery, or important part at the bottom of the tumor, and the lancet penetrates into the cavity of the abſceſs with more certainty and eaſe, and with leſs pain. With the other hand an inciſion of the integuments is to be made in ſuch a direction, that it terminate at the moſt depending part of the tumor; and ſhould be made of ſuch length as may appear neceſſary, in order that the matter may be allowed freely to eſcape. It is in general ſuppoſed ſufficient, in caſes of ſmall abſceſſes, that the inciſion extend two thirds of the length of the tumor. Some authors have adviſed, that when the integuments are much diſtended, an inciſion ſhould be made through the whole length of the tumor, even where 14 Plate DXIII. Fig. 1

Of Abſceſſes.

where it is of a large ſize; but this practice ought to be rarely adopted. The irritation and conſequent inflammation, produced from ſuch an operation, muſt always be very conſiderable; and as it ſcarcely ever happens that the integuments are ever ſo much extended as entirely to loſe their contractile power, there is always reaſon to hope that they will recover their natural dimenſions. In all very large abſceſſes, it is the ſafeſt practice to make at firſt a ſmall inciſion ſufficient to allow the contents to be diſcharged; for whenever this is done, the extent of the cavity rather diminiſhes; and ſhould it be found afterwards neceſſary to make a more extenſive opening, this can now be done with much advantage. When an abſceſs has been opened by either of theſe methods, it is reduced to the ſtate of a ſimple wound or ulcer, and ought to be treated accordingly.

The mode by inciſion ought to be preferred to that of cauſtic, when the matter is collected deep; when it is in the neighbourhood of important nerves or blood-veſſels; when it is neceſſary to make the opening large; when the ſkin which is to be opened has a natural appearance; and, above all, when the ulcer is wiſhed for to be healed rapidly up, and leave little deformity.

Although ſurgeons generally agree in preferring the inciſion to the cauſtic, it has nevertheleſs its inconveniences. Whenever the inciſion is made, the matter contained in the tumor is ſuddenly evacuated; from whence it happens, when the collection is conſiderable, that the patient faints, or has ſome other diſagreeable ſymptoms; but the principal diſadvantage of this method is, that it gives free acceſs to the air over a large extent of the ulcerated ſurface; a circumſtance which is followed by very pernicious effects, particularly in large abſceſſes. A total change takes place in the nature of the matter; a laudable pus is transformed into an ichorous indigeſted fluid; the pulſe becomes quick; colliquative ſweats and other ſymptoms of fever come on, and commonly the patient dies in a ſhort time. Surgeons have too often occaſion to obſerve the dangerous effects which probably are altogether produced by the admiſſion of the air; for we ſee a great number of patients have for a long time after a termination of inflammatory diſeaſes conſiderable abſceſſes, where the pus is perfectly formed, without ſhewing at the ſame time any ſymptom of hectic fever. But when theſe abſceſſes exceed a certain ſize, and if a large inciſion be made into them, there always follow ſymptoms of fever, generally in forty-eight hours from the time that the abſceſs had been opened. Theſe accidents, which we have frequently obſerved in private practice, are ſtill more frequent in great hoſpitals, where the air is impregnated with putrid exhalations.

25 3. *By the Seton.*—From the obſervations which have been already made, it appears neceſſary that as much precaution as poſſible ſhould be taken to prevent the contact of the air with the internal ſurface of the abſceſs. The ſeton, therefore, has the advantage, not only of being attended with little pain, and emptying the abſceſs in a gradual manner, but it completely prevents the acceſs of the air. When patients are otherwiſe in good health, there is another advantage in employing the ſeton; for frequently a cure is obtained at a period much ſhorter than that which is uſually neceſſary when the inciſion has been adopted. On the other hand, if we have reaſon to wiſh to keep up for a long time a certain degree of irritation and ſuppuration in the affected part, the ſeton ought to be preferred to every other means. There have been various inſtruments contrived for introducing the ſeton, and it may eaſily be done by a lancet and common probe, or by the inſtruments repreſented in Plate DXIII. fig. 15. and 16. One of theſe being threaded with glovers ſoft ſilk or with cotton, ſhould be introduced into the upper part of the tumor; but if the blunt one be employed, it will be neceſſary to have the aſſiſtance of the lancet. The inſtrument is then to be brought out at the under part of the tumor, and the matter allowed to run gradually along the threads. The ſeton ſhould be changed forty-eight hours after it has been introduced, and as much of it ſhould be pulled out at the under part as is ſufficient to allow the removal of that which was ſhut up in the abſceſs. The abſceſs is to be dreſſed in this manner every day as long as circumſtances ſeem to require.

By means of the ſeton, we obtain a regular and ſlow diſcharge of the matter contained in the abſceſs; the ſides of the abſceſs are allowed to contract in a gradual manner; the preſence and friction of the ſeton on the ſurfaces, excites a ſlight inflammation which contributes to unite them, and to complete an adheſion, much more readily than by any other method. In proportion as the diſcharge diminiſhes, the thickneſs of the ſeton ought to be leſſened; and this is eaſily done by taking out ſome of the threads of the cotton every two or three days. It ought to be entirely taken out when no more matter is diſcharged than what would be produced by the irritation of the ſeton alone; and by compreſſing gently the parts for ſome days after it has been withdrawn, with a compreſs and bandage, we can in general depend upon a complete cure.

When ſpeaking of the mode of introducing the ſeton, we recommended that this ſhould be done from above downwards, becauſe, if the firſt opening be made at the baſe of the tumor, a great quantity of matter immediately eſcapes. Thus the boundaries of the abſceſs at the upper part become effaced, and the paſſage of the director along the abſceſs is much more difficult than when the abſceſs is opened according to the manner we have pointed out. In that way the under part of the tumor is left completely diſtended till the laſt moments, and only a very ſmall quantity of matter eſcapes by the ſuperior orifice. Another advantage is, that the part of the ſeton left for the future dreſſings, is eaſily kept clean and dry.

The method of opening abſceſſes by the ſeton has been found particularly uſeful in ſuppurations of the joints, and in all thoſe glandular parts where the admiſſion of the air is followed by very pernicious effects. Thus, when it is thought neceſſary to open a ſcrofulous tumour, we may generally be able to obtain a more prompt and eaſy cure from the uſe of the ſeton, than by making a larger inciſion. Venereal buboes, too, when come to maturity, have been ſaid to get well much ſooner by this than by any other method, when the integuments have not become too thin by great diſtenſion long continued. On the other hand, this mode is not without its inconveniencies, for in adopting it we cannot be well aſſured of the ſtate of the bottom of the abſceſs, which it is often important to know.

Whatever advantages theſe different methods of opening abſceſſes may poſſeſs over one another, yet there is not one of them which deſerves the preference in all caſes, although the cauſtic, as already mentioned, be the means

to which we ought moſt rarely to have recourſe. However troubleſome it may be, the action of the air on the interior ſurface of the abſceſs is not always equally pernicious; and when by properly applied dreſſings, care is taken not to allow purulent matter to form in any particular cavity, and to prevent the acceſs of cold air on the ſurface of the wound, and above all when the ſurrounding air, as that in hoſpitals, is contaminated with putrid exhalations, daily experience ſhews, that the method by inciſion is accompanied with moſt ſucceſs. On the other hand, we have ſeen the ſeton extremely uſeful in gradually diſcharging, and without exciting much inflammation, large abſceſſes.

Theſe are the general principles we have to obſerve in the treatment of abſceſſes, in whatever part of the body they are found. There are, however, ſome modifications, ſome particular details of practice, which ought to be kept in view, when the diſeaſe is ſeated in particular organs, as the eyes, the mammæ, the cavity of the cheſt, the groin, the ſcrotum, &c. Mention will be made of theſe in giving an account of the diſeaſes of the particular organs.

Sect. III. *Of Sinuſes* (Fiſtulæ).

16 When an abſceſs, inſtead of healing continues to diſcharge purulent matter, and when this takes place through a ſmall orifice, it obtains the name of a *fiſtula*. The orifice has ſmooth and callous edges, and the fiſtula commonly communicates with one or more cavities of different dimenſions, ſituated in the cellular membrane, between the common integuments and the muſcles, or between the interſtices of the muſcles themſelves.

Theſe different cavities, which are generally known by the name of *ſinuſes*, ſerve as reſervoirs, both for the matter which is formed in the body of the ulcer, and for that furniſhed by their own ſides. It is thus that when by compreſſion, the matter contained in the ſinuſes is preſſed out through the ulcers, theſe diſcharge a much greater quantity than what might have been expected, by conſidering the extent of their ſurface alone.

This deſcription of a fiſtulous ulcer indicates the moſt ſimple form of the diſeaſe; but when it has laſted for a long time, the whole internal ſurface frequently becomes hard and callous, acquiring the properties and ſtructure of a *mucous* ſurface.

The moſt frequent cauſe of the formation of ſinuſes is, when an abſceſs burſts, that the purulent matter, inſtead of being all diſcharged, remains ſhut up in ſome part of the cavity. Remaining there, it naturally falls to the lower part, and gradually inſinuates itſelf among the layers of the cellular membrane, which, from its ſoftneſs, gives little reſiſtance; it advances by degrees among the interſtices of the more ſolid organs, which are connected by that ſubſtance alone; and at laſt it makes its appearance on the ſurface of the body, or penetrates into one of the cavities. Both recent and old fiſtulous ulcers are generally curable, provided that the ulcer be ſituated in ſuch a manner, that the neceſſary remedies can be applied to it, and that the conſtitution be otherwiſe free from diſorder. But when the diſeaſe has been of very long duration, and, above all, when the ſinuſes open into any articulating cavity, or are placed in ſuch a manner, that one cannot practiſe any operation, the treatment then becomes extremely difficult, and the event very doubtful. There is no diſeaſe which reſiſts more frequently all the efforts of art than certain ſpecies of fiſtula, and particularly ſome of thoſe about the anus and perinæum.

Of the treatment of Fiſtulæ.—There are ſeveral different modes which have been propoſed for the treatment of this diſeaſe, all of which may be uſeful in particular caſes.

17 By injection.

Injections, ſuppoſed to have a cicatrizing quality, have been propoſed by ſome; and theſe are no doubt uſeful in particular caſes, in diminiſhing the quantity of the diſcharge, and in preventing the extent of the ſinus from increaſing. When the diſeaſe is far advanced, and the edges become perfectly callous, injections of an eſcharotic quality have been employed; but theſe remedies have ſeldom, if ever, produced any good effects; and their too frequent uſe has even rendered ſinuſes hard and callous, which were of a more benign nature.

18 By compreſſion.

In ſome caſes, particularly when the diſeaſe is recent, great advantage may be derived from the proper application of a compreſs and bandage. In applying theſe, the compreſs ſhould be placed in ſuch a manner, and made of ſuch a form, as to make a firm preſſure from the bottom of the ſinus towards its orifice; and care ſhould be taken that no preſſure be made towards the orifice itſelf, in order that any matter which is formed may not be allowed to collect, but be diſcharged from it. Indeed in whatever mode we treat ſinuſes, the object to be held in view, is to allow any matter which is formed to be immediately diſcharged.

Some have adviſed, that, in all fiſtulæ of long ſtanding, their cavities ſhould be laid open from one end to the other, and all the parts ſhould be diſſected out which have become hard, and thus to convert the whole into an ulcer, and treat it in the ordinary manner. There is no doubt, but that by ſuch an operation, it will often be poſſible to obtain a cure; but independent of the great pain, and of the large and diſagreeable cicatrix which muſt always follow, the practice is not without danger. It cannot anſwer, for inſtance, in thoſe fiſtulas which extend far up the rectum. No practitioner ſurely would adviſe the adoption of ſuch a method in the caſe of fiſtulas which penetrate very deep, and extend, as often happens, underneath the blood-veſſels, the tendons, and the nerves; and even although this practice was without danger, it ought to be adopted in no caſe, as we are enabled, by an operation more ſimple, and much leſs painful, always to obtain a cure with as much certainty, as by a total deſtruction of the parts.

19 By inciſion.

In the treatment of fiſtulas, it is neceſſary to procure an agglutination of the edges of the ſinuſes, ſo as to obliterate the cavity. The means moſt efficacious to fulfil this indication are, to make firſt an opening, ſo as to allow the exit of the matter; and to excite a certain degree of inflammation on the internal ſurface of the cavity, ſo as to produce an adheſion between its ſides.

Both of theſe indications may, in ſome caſes, be fulfilled in the moſt convenient manner, by introducing into the orifice of the ulcer a ſeton which will follow the whole courſe of the ſinus as far as its oppoſite extremity. The ſeton ſhould be of a ſize proportioned to that of the ſinus; and it may be diminiſhed by degrees as the cure advances, by taking away ſome of the threads day after day. At laſt, when the cavity of the ſinus is nearly

Of Sinuses.

nearly filled up, and consequently the discharge much moderated, the seton ought to be withdrawn. Afterwards a bandage is to be firmly applied over the part, which should be allowed to continue a convenient time, in order to obtain a complete cure. In all cases, therefore, we ought to discover the direction of the sinus, which can commonly be done by introducing a probe, or by observing the place in which the matter collects, when it has been allowed time to accumulate, and by marking the place from whence it comes, the pressure is to be made on the affected part. A seton ought then to be introduced into each sinus.

Another means of procuring the obliteration of sinuses is, by a longitudinal incision along the whole cavity. In cases where the fistula extends to parts which it is not dangerous to cut, and where the seton has inconveniences which render it inadmissible, we should not hesitate to have recourse to this means. Indeed, the longitudinal incision of the sinus is to be considered in all cases, as the only means which can be adopted with certainty in the cure of the disease; and though in many cases it may be proper to attempt the cure by the milder means which have been mentioned, yet they often fail, and the mode by incision ought always to be held in view.

We may observe here, that this part of surgery owes much to the celebrated Mr Pott, he having rendered much more simple and successful the treatment of fistulas, particularly those situated in the perinæum and anus. When a fistula is to be laid open, the first thing to be done, is to determine the extent of the incision. The exact extent of the sinus should be accurately ascertained with a probe, and it is necessary to lay it open to the extreme point, in order completely to secure the filling up of the cavity. The operation may be performed by introducing a director (fig. 9. and 12.), along the whole course of the sinus, and cutting on it with a common scalpel (fig. 1.); or the sharp-pointed bistoury (fig. 4.) may be introduced along the groove of the director, the point of the instrument pushed through at the bottom of the sinus, and then, by withdrawing the director, the incision may be speedily completed with the bistoury.

Plate DXIII.

A still better method is one we have often adopted in cases of sinus with the greatest advantage. It consists simply in putting a small bit of wax, about the size of a pin head, upon the end of a sharp-pointed bistoury, introducing the point of the instrument thus defended along the sinus; and when it arrives at the bottom of it, the point may be pushed through the skin, and displace the wax with very little pressure. When the point has been brought through the skin, the incision may afterwards be completed with one quick motion of the knife. In laying open sinuses in this manner, it is particularly necessary to form an exact idea of the direction of the sinus, and of the extent of the incision to be made, before attempting to introduce the bistoury. For as a very slight degree of pressure is sufficient to displace the wax on its point, any untoward motion upon the side of the abscess would thus expose the point of the instrument, and render the operation more tedious and difficult, and always more painful.

The principal advantages of this mode of laying open sinuses are, that the operation can be much more speedily performed, and that it costs much less pain to the patient. The introduction of the director through a small fistulous opening, and the tedious process of cutting through the integuments with a scalpel, cannot fail of creating much distress, whereas a thin bistoury can be introduced without giving almost any uneasiness; and after the operator has conducted its point to the bottom of the sinus, it may be pushed through the integuments, and the sinus cut open with a *coup de main*.

Of the Whitloe.

All sinuses should be laid open in this manner, which can be detected by a careful examination with the probe; and if the edges of the fistulous sore are found to have acquired a great degree of callosity, it is also sometimes adviseable to cut them entirely away.

The sinuses are now to be dressed by placing between the edges portions of caddis dipped in oil, or simple ointment; and great care should be taken that no portion of newly divided parts be allowed to come into contact, as there will be great risk of an adhesion taking place between them, thus frustrating the very objects of the operation. After the pledgets have been introduced between the edges of the wound, it is commonly directed that the whole wound be covered up with a piece of linen spread with ointment. In place of the ointment, we have generally found a poultice answer better. The poultice, by its moisture prevents any agglutination of the lips of the wound; and it has the power of diminishing the inflammation more than any other application. The wound is afterwards to be treated on the principle of the common ulcer *.

* See *Ulcers*.

Sect. IV. *Of the Whitloe* (Paronichia).

The whitloe is a painful inflammatory swelling, occupying the extremities of the fingers, most frequently at the root of the nails. Several varieties of the disease have been described by authors; but these differences only consist in the depth the disease is supposed to have been seated. From what we have been able to observe, it appears to be situated chiefly in the cellular membrane immediately underneath the skin, and in the structure connected with the nails; though at the sametime the pathology of this disease is not yet well understood. 20

The first symptom of the whitloe is an uneasy burning sensation over the point of the finger, or root of the nail. The part becomes tender and painful to the touch; and a slight degree of swelling takes place, resembling œdema, attended by little discolouration. A transparent effusion takes place below the epidermis, and forms a vesication round the root of the nail. A purulent discharge takes place round the edge of the nail, and the nail always separates. The peculiarity in this disease is, that it generally affects several fingers, one after the other, and sometimes all the fingers of both hands.

In the more severe forms of the disease, the inflammation extends to the cellular membrane underneath the skin, and even to the tendinous aponeurosis and periosteum of the fingers, producing caries. In such cases the whole hand generally swells, and the swelling even extends up the arm and affects the axillary glands.

Whitloes sometimes succeed a blow or injury of the finger; but they most usually make their appearance without any known cause.

Treatment.—In the treatment of whitloe, two sets of 21
remedies

Of the Carbuncle.

remedies have been employed. Some use fomentations, poultices, and leeches; whilst others apply ardent spirits, vinegar, cold water, and astringents.

Local bleeding and emollients do not seem to give the same relief in this as in other species of inflammation. When, however, the inflammatory symptoms and pain are violent, it is always necessary to take away some blood; and this may be best done at the bend of the arm. The affected part should be afterwards immersed in strong brandy, spirit of wine, or alcohol or strong vinegar. We have also seen the inflammation much abated by immersing the hand, on its first commencement, in a very large vessel of cold water.

It is only, however, in the first stages of this affection that remedies of this kind can prove useful: for, when effusion has actually taken place, and suppuration begun, that state of the disease is produced which these remedies were intended to prevent. Emollient remedies should now be employed; and whenever the presence of a fluid can be ascertained, it should be discharged with a lancet.

The wound is afterwards to be treated as a common abscess; but we may remark, that here, more than in any other part of the body, it is of the greatest importance to lay open freely every sinus, which a patient use of the probe can detect. Sinuses, situated here, never heal; and, when allowed to spread, are always attended with mischief. They destroy ligaments and tendons, or at least produce a thickening of the parts around the joints, so as afterwards to interrupt their free motion.

Sect. V. *Of the Carbuncle.*

22 The carbuncle (*anthrax*) may be considered as a species of phlegmon, attended with a remarkable degree of malignity, and is one of the symptoms of the plague, where that disease rages, or of typhus fever in this country. It consists in a deep-seated very hard swelling, attended with an intensely painful sense of burning in the part, and considerable discolouration of the skin.

The carbuncle is often sudden in its appearance. It is of a dusky red colour at its centre, but much paler and variegated at its circumference. Vesications appear on its surface, and when these are ruptured they discharge a dark-coloured sanies. The disease sometimes commences with symptoms of general inflammation; but most commonly it is attended with rigors, sickness, great restlessness and depression of strength, fainting, delirium, &c. A miliary eruption, or even petechiæ, are also sometimes found dispersed in different parts of the body.

When suppuration takes place, several openings generally form in the skin, a thin ichorous fluid is discharged, and a dark yellow slough is observed at the bottom of the sore.

The carbuncle most frequently takes place about the back, neck, and shoulders, and is generally solitary. They are usually two or three inches in diameter, though sometimes they acquire an enormous size.

The cellular membrane and skin seem to be the principal textures affected in this disease; a great part of the former is always destroyed by the formation and separation of very large sloughs, and that of the latter by the extensive ulceration.

Of Encysted Tumors.

In the treatment of this disease great attention is necessary, not only to the local applications, but also to the general remedies. 23

Emollient poultices, and warm anodyne fomentations, ought to be employed during the first stages of the disease; and when ulceration of the skin has taken place, the application of an ointment, composed of a considerable quantity of the powder of opium, we have found to relieve very much the pain which the ulcerative process generally creates. The use of rags, wet with diluted nitrous acid, or a solution of lunar caustic, has been found of great use in promoting the separation of the slough, and the granulation of the cavities which remain.

When the constitutional symptoms are inflammatory in their commencement, it may be necessary to employ general blood-letting; but the fever being commonly of a typhoid form, wine, bark, and opium, ought to be freely administered. It will be also proper to prescribe a generous diet, and to pay great attention to keep the bowels regular.

Sect. VI. *Of Encysted Tumors.*

24 General observations on tumors.

The word *tumor* has been the origin of much confusion in the arrangements of diseases adopted by the most celebrated nosologists; they have employed it as a term to characterise a *class*, and also as expressing merely a *symptom* of diseases. A vast variety of diseases have been thus included under the class of tumors, diseases which are totally dissimilar, and have no analogy whatever. Anasarca, bubo, encysted tumors, scrofulous and scirrhous tumors, warts, &c. have all been included under this class, these being as different from one another as any disease with which we are acquainted, having only one common symptom, which is that of swelling.

Mr Abernethy has lately made a very laudable attempt to arrange tumors from their anatomical structure; but, like those who preceded him, he has classed diseases together, among which no analogy can be discovered. He divides tumors into sarcomatous, encysted, and osseous. Under the sarcoma he includes the steatom (adipose sarcoma), medullary sarcoma, and others, all of which have no resemblance to each other in their history or symptoms.

The word *tumor* ought therefore to be expunged from nosology, and be no longer employed to characterise a class of diseases. Its use should be synonymous with that of swelling, and be confined to express merely an enlargement of any organ of the body, or a new growth; whilst all those diseases, which have been formerly classed among tumors, should be arranged either according to their specific nature, or to the texture of the body in which they arise. Thus tumors, connected with *lues venerea* or *scrofula*, should be included under these general names. The *steatom*, being a growth of fat, and being always formed in the cellular membrane, ought to be treated of among the diseases of that texture. Encysted tumors, being also formed in the cellular membrane, ought to be arranged among its diseases; and warts, corns, and other tumors being diseases of the skin, will be with propriety classed among them: and the same may be said of all other diseases which have usually received the general appellation of tumor.

Of Encysted Tumors.

tumor. We shall, therefore, in this section, treat of those tumors only which are formed in the cellular membrane.

Under the class of encysted tumors (*tumeurs enkystiés, loups cystides*), are comprehended all those tumors of preternatural formation, the contents of which are surrounded by a bag or cyst.

25 Of Encysted tumors.

Encysted tumors are generally formed in the cellular membrane, immediately underneath the common integuments, they are moveable, circumscribed, commonly indolent, without heat or any change of colour in the skin; and they are very slow in their formation and progress. They contain a matter more or less thick in consistence; and, according to the nature and consistence of this matter, they are distinguished by different names. They have been denominated *atheroma*, from the contents being of a soft cheesy consistence; *meliceris*, when they contain a matter of the consistence of honey; and *steatoma*, when formed of fat. The steatom, however, ought not to be classed among the encysted tumors, as the thin cellular covering in which it is contained has no analogy in its structure to the *cyst* of the other tumors.

It ought to be observed, that the consistence of the matter contained within the cyst varies in every species of encysted tumor. In the *atheroma* and *meliceris* they have sometimes the consistence and firmness of new cheese, and at other times they are softer than the most liquid honey. These varieties depend on the length of time which the fluids have remained in the cysts, and in the proportion of coagulable lymph and serum, which have been separated and absorbed, and also from their having been inflamed or not, and on the extent to which this inflammation may have proceeded. Sometimes an encysted tumor is composed of different cysts, each of which contains a substance of a different nature. These different circumstances render in general the diagnosis in the varieties of encysted tumors very difficult; and happily this distinction is not necessary in practice, and perhaps ought also to be omitted in our nosological arrangements. The sac of an encysted tumor is generally pretty firm, and composed of concentric lamellæ. We have observed some of the cysts which were nearly as firm as cartilage, having small chalky concretions formed in many parts between each layer. When the contents of the tumor are washed out, the internal surface of the sac generally appears smooth and polished; but, in others, some of the matter adheres firmly to the surface of the sac. In some cases the tumor very much resembles the hydatids found in the liver and other organs; for, besides the firm sac, there is sometimes formed within it, and apparently having no adhesion with it, a thin and very easily torn whitish bag, which contains the fluid.

Encysted tumors are very small at their commencement, and grow by almost insensible degrees. They vary a good deal in their form and size. Those which are formed in the hip, are generally round and smooth; commonly of the size of a nut, and acquire rarely the bulk of a large egg. Those which are seated in other parts of the body are more irregularly formed, and sometimes become of a prodigious size, some having been found which weighed 10, 15, and even 20 lbs. They are never painful, at least at their commencement, and the skin preserves, for a long time, its natural colour; but when they become very large, the veins of the skin are large, and become varicose; and the skin on their upper part becomes polished, and acquires a reddish colour, similar to that of a part inflamed. They seldom give pain or uneasiness, except when they receive a blow. Inflammation and pain then easily come on, and the cyst becomes ruptured, if it is not previously opened by an instrument.

Such is the usual progress of encysted tumors; and although they do not come to a rapid termination, yet this sometimes happens more readily under certain circumstances, and even before they have acquired a large size. In the hip, for example, we perceive the integuments become tender and very thin, and open before the tumor has acquired any considerable size. But on other parts of the body, and particularly the back, shoulders, and thighs, the integuments preserve their natural appearance, even when the tumor has acquired a large bulk. This appears to arise from the skin being more loose in these parts.

The situation of encysted tumors also contributes much to determine the degree of adhesion which they have contracted with the neighbouring parts. In some situations they are so detached, especially while they continue small, that they readily alter their situation by very slight degrees of pressure; but in others, particularly when covered by any muscular fibre, they are more firmly fixed from their commencement. The attachment of encysted tumors is also influenced by their remaining more or less free from inflammation; for they never become inflamed, even in the slightest manner, without some degree of adhesion being produced between the cysts and contiguous parts.

26 Mode of their formation.

It has been generally supposed that the membrane which forms the cyst of this species of tumor is not a new formation in this part, but that it is formed by a collection of fluid in one of the cells of the cellular membrane, which by its increase dilates the cell, and brings it in close contact with the adjacent cells so as finally to obliterate them, and increase the thickness of its own coats.

The ingenious Bichât * has shown that this opinion so generally adopted is without foundation, and that the formation of encysted tumors more probably depends on laws, analogous to those which regulate the growth of the different parts of our bodies. He has also shown that there is a great analogy between these cysts and the *serous* membranes.

* Vide *Anatomie Generale*.

The cysts, like serous membranes, form a species of sac without an opening; they contain the fluid which they exhale, and they have a smooth and polished surface contiguous to the fluid, whilst the other surface is unequal, and connected with the adjacent cellular membrane.

The cysts have a similar structure to serous membranes; maceration, &c. proving them both to be composed of a cellular texture. In the natural state neither of them have any sensibility, but when inflamed they both become extremely sensible. The cysts also are evidently secretory organs, exhaling the fluid with which they are filled, and their power of absorption is also very manifest from the spontaneous cures of some encysted dropsies.

These considerations led Bichât to conclude that there exists a perfect resemblance between the cysts of the

Of Encysted Tumors.

the encysted tumors and the serous membranes. An important question here presents itself, to know how these cysts are formed, how a membrane which did not exist in the natural state can be produced, can grow, and even acquire a considerable developement under certain circumstances? The mechanical explanation of these phenomena which has been already mentioned, though it at first sight may appear simple and satisfactory, yet it is by no means conformable to the usual proceedings of nature. How does it happen that as the cysts and serous membranes are analogous, that these membranes are formed in a different manner, the serous membranes being never formed from a compression of the cellular membrane? How is it, if the cells are applied and compacted with one another so as to form a sac, that the neighbouring cellular membrane does not disappear, or even diminish, whilst the sac acquires a large bulk? These reflections would lead us to believe with Bichât, that the common manner of explaining the formation of cysts is essentially different from the manner in which nature generally follows in all her operations.

Bichât ingeniously remarks that all tumors which vegetate externally, or appear internally, are formed and grow in the same manner as the cysts, there being no difference between these two morbid productions but in the form in which each of them appears. Most tumors throw out upon their external surface the fluid which they separate. The cyst, on the contrary, exhales that fluid from its internal surface, and preserves it in its cavity. "Suppose a fungous tumor in suppuration (says Bichât), transformed in a moment into a cavity, and the suppuration to be transported from the external surface to the sides of the cavity, that cavity will then become a cyst.—Reciprocally, suppose a superficial cyst, the cavity of which is obliterated, and of which the fluid is exhaled from its external surface, you will then have a tumor in suppuration.

"If therefore the form alone establishes the difference between tumors and cysts, how does it happen that the formation of the latter is not analogous to that of the first? or has ever any one attempted to attribute the formation of external or internal tumors to compression? We ought therefore to conceive the production of cysts in the following manner: they begin to be formed in the cellular membrane by laws analogous to those which regulate the general growth of our bodies, and which appear to be deviations of these fundamental laws of which we are ignorant. When the cyst is once formed, exhalation begins to take place, and though at first in a small degree, it at last augments in proportion to its progress. The increase of the exhalent organ then always precedes the accumulation of the exhaled fluid, in such a manner that the quantity of the suppuration of a tumor is always directly in proportion to its bulk *."

* Vide *Anatomie Generale.*

This mode of explaining the formation of cysts appears much more conformable to the laws of nature than that which has been formerly mentioned and generally received. But it still remains to determine the precise mechanism of the origin and growth of cysts, and consequently of all other tumors. We ought to stop where the first causes commence; and as we do not know the mechanism of the natural growth of our organs, how ought we to guess at that of morbid productions which depend upon the same laws. It is a great deal in the economy of our organs to point out analogies, and to show the uniformity of a phenomenon not understood with one in regard to which all the world agree. Much would be done for the benefit of science, if in all its branches we could demonstrate that principle on which depends such a great number of effects, that nature, avaricious in her means, is prodigal in her results; that a few causes preside over a multitude of effects, and that the greater number of those regarding which we are uncertain, depend on the same principles as many others which appear to us evident.

Of the treatment of Encysted Tumors.—Encysted tumors, though not dangerous, are often inconvenient from their size, situation, and from the deformity which they produce, so that whenever their removal becomes necessary, this can be done alone by a surgical operation. 27

If the tumor be of the thin or *meliceris* kind, which for the most part will be the case when a distinct fluctuation is perceived in it, it ought to be treated as a common abscess. If the tumor be small, the matter may be discharged by laying open the most dependent part of it with a common lancet, and treating it in the ordinary way till the sides of the cavity come in contact by adhesion, or by the process of granulation. But when the tumor is more considerable, the free admission of air into the interior of its cavity is always dangerous; and we ought to be attentive to prevent its effects by making the opening in such a manner, that the wound be exposed as little as possible. When treating of abscesses, we have recommended the passing of a seton or cord through them, as the best method of opening them when they are of a large size. This method is also very convenient in the case of encysted tumors, which contain a matter of a liquid consistence. It will only be necessary here to observe, that the seton should traverse the whole tumor, from the superior part of it to the most depending point, and that the inferior opening should be sufficiently large for allowing the matter to be freely discharged. This method often answers extremely well; and cures have been performed by it which could not have been obtained in so short a time in following the ordinary method of treatment by incision. But this method cannot be employed, except in those cases in which the contents of the tumor are so liquid as to be easily discharged by a small opening. When it is of too firm a consistence to admit of the seton, the contents must be emptied, either by making an extensive opening into the cyst, or the cyst and its contents may be dissected out. 28 By the seton.

When an encysted tumor adheres so firmly to the contiguous parts, as to render its removal tedious and difficult, it is often better not to undertake the operation. In such a case it will be sufficient to lay open the tumor its whole length, and to cut away any portions of the cyst which can be easily detached. The contents of the tumor will in this manner be completely removed, and the cure will be effected, either by keeping the wound open till the cavity of the cyst is filled with granulations; or it may be attempted by drawing the divided edges of the skin together, and applying moderate pressure, so as to produce adhesion within the sides of the cavity. It sometimes happens, however, that from the adhesion being complete, the remaining portion

Of Encysted Tumors.

tion of the cyst forms as it were the nucleus of a new tumor.

29 *Operation.*—When it is determined upon to remove the cyst completely, the first step of the operation is to make a free incision through the integuments covering the tumor with a common scalpel *. If the tumor be not very large, a longitudinal incision will answer the purpose; but should the tumor be of such a size, that the whole integuments covering it are too large to lie neatly upon the wound, it is much better to remove an oval portion of them †. The size of this portion must be left entirely to the judgement of the operator, who should always take care that a sufficient quantity is left, so as completely to cover the wound. After the skin is divided, the cellular membrane should be dissected back, so as distinctly to expose the surface of the sac; and as the sac will be generally found loosely attached to the adjacent parts, it may be easily separated by a very simple dissection. In removing encysted tumours, it is particularly necessary to cut fairly down upon the sac; for if this be not done, instead of the tumor being readily turned out of the sheath of loose cellular membrane which surrounds it, it can only be removed by a very tedious process of dissection. Some surgeons have recommended that the contents of the tumor should be removed, before attempting to dissect out the sac; but if the incision of the integuments be made sufficiently large, this may be generally avoided. We have often observed the operation of extirpating encysted tumors, and indeed tumors of every description, rendered extremely tedious by a want of proper attention to this step of the operation. We would therefore particularly recommend, that in the extirpation of all tumors, the incision of the integuments extend both above and below the tumor a considerable way, proportioned in all cases to its bulk and easy access.

* See Plate DXIII. fig. 1.

† See *the tumor represented in* Plate DXIII. fig. 19.

In some cases it is adviseable to open the cyst, and remove its contents, before an attempt be made to dissect it out. This practice will only be necessary in cases where, either from the shape or situation of the tumor, it is impracticable to pass the knife round it, and where, from the situation of important parts at its base, the dissection is rendered very nice and delicate. We remember a case of encysted tumor closely attached to the capsule of the knee joint, where great assistance was derived from operating in this manner. Whilst the tumor remained distended, it was impossible to separate it, without running great risk of cutting, either into it, or into the cavity of the knee joint. When, however, its contents were removed, the tumors could be readily dissected from one another, without the smallest risk of injury.

After an encysted tumour is extirpated, if any artery bleed very profusely, it ought to be secured by a ligature; but this should always be avoided as much as possible, as ligatures are apt to interfere with the adhesion of the lips of the wound. At the same time it is always necessary that the bleeding be completely stopped before the wound is dressed; for should any hemorrhagy take place after the dressings have been applied, it is very apt to displace the edges of the wound, and prevent them from adhering by adhesion.

The edges of the wound are to be placed accurately together, and kept in contact with adhesive plaster, a compress and proper bandage being applied over it. The wound is to be treated in the usual manner, removing the dressings whenever they become soiled, and the application of the adhesive plaster continued till a complete cicatrization has taken place.

SECT. VII. *Of the Steatom* or *Fatty Tumor* (B). 30

This species of tumor consists of a mere accumulation of cellular membrane and fat in a particular part of the body. They occur frequently, and are formed most commonly on the front or back part of the trunk of the body, and sometimes in the extremities. They generally grow in a slow and progressive manner, and the blood-vessels are neither large nor numerous. They have always a thin capsule of common cellular substance; and this capsule seems merely to be the effect of that condensation of the surrounding cellular substance which the pressure of the tumor occasions. "As the growth of adipose tumors is regularly and slowly progressive, and as nothing like inflammation in general accompanies their increase, their capsules afford a striking instance of an investment acquired, simply by a slight condensation of the surrounding cellular structure, unaffected by inflammation *." When the capsule, which is extremely thin, and which adheres but slightly to the tumor, is removed, the tumor within consists of a mere piece of fat, more or less compacted according to its situation in the body, and the length of time which it has remained.

* *Abernethy's Surgical Observations*, p. 27.

31 *Of the treatment of the Steatom.*—When a steatom is small, when it causes little deformity, and when it does not seem to injure the functions of any organ, it is most prudent to allow it to remain. They sometimes, however, acquire a very large bulk, and from their situation are extremely inconvenient and unseemly, and they then become an object of medical treatment. No external application was ever known to be useful in discussing tumors of this kind; and the only means to be employed for removing them is by an operation. There is indeed no species of tumors that can be dissected out with so much celerity, or with such apparent dexterity. In some cases, however, if inflammation has been induced, the capsules even of these tumors are thickened, and adhere so as not to be separated without difficulty from their surface.

In dissecting out a tumor of this kind, the same general rules may be followed as we mentioned when treating of encysted tumors. The external incision should be made very free, and it is also of great importance to cut completely down to the capsule of the tumor, before attempting to dissect it out.

SECT. VIII. *Of the Sarcoma* or *Fleshy Tumor.* 32

Our knowledge of the pathology of tumors of the cellular membrane is yet too limited to be able to arrange them in any systematic form; and it would be foreign to our purpose to attempt in this place the investigation

(B) Steatoma, *adipose sarcoma* of Mr Abernethy.

Sarcomatous Tumors.

veſtigation of the ſubject. We have adopted the term *ſarcoma* as very general; and include under it all thoſe ſwellings or wens of a fleſhy feel, which occur in the cellular membrane thoughout the body.

The baſis of theſe tumors, as we before mentioned, is the cellular membrane; and the difference in the qualities of the ſubſtances depoſited in the cells gives the peculiar appearance to the tumor.

The veſſels which pervade them are either larger or ſmaller, and more or leſs numerous. They are alſo diſtributed in their uſual arboreſcent manner, without any deſcribeable peculiarity of arrangement.

When tumors of this kind have attained a conſiderable ſize, the ſuperficial veins appear remarkably large. They have little ſenſibility, enduring a rough examination.

This kind of tumor generally grows till the ſkin is ſo diſtended that it ulcerates, and expoſes the new formed ſubſtance, which ſloughs away. In this manner does the diſeaſe occaſionally terminate; but ſuch is the conſtitutional irritation attending this proceſs, and the diſguſting fœtor and frightful appearance of the part, that the ſurgeon generally recommends its removal. In ſome inſtances ſarcomatous tumors are compoſed of a number of irregular-ſhaped maſſes, which from their reſemblance to the pancreas have been called by Mr Abernethy the *pancreatic ſarcoma*, and conſidered as a diſtinct ſpecies. "This new-formed ſubſtance is made up of irregularly-ſhaped maſſes, which in colour, texture, and ſize, reſemble the larger maſſes compoſing the pancreas. They appear alſo to be connected to each other like the portion of that gland, by a fibrous ſubſtance of a looſer texture." Other ſarcomatous tumors are compoſed of a number of cyſts, containing ſometimes a tranſparent and ſometimes a dark fluid; and have been called by Mr Abernethy, the *cyſtic ſarcomas*.

33 The *Mammary* and *Tuberculated Sarcomas* are alſo other two ſpecies enumerated by Mr Abernethy. In the firſt the ſtructure of the tumor has been ſuppoſed to reſemble the natural ſtructure of the mamma, and in the ſecond the tumor "conſiſts of an aggregation of ſmall, firm, roundiſh tumors of different ſizes and colours, connected together by a kind of cellular texture. The ſize of the tubercle is from that of a pea to that of a horſe-bean, or ſometimes larger; the colour of a browniſh red, and ſome are of a yellow tint (c)."

Theſe different terms employed to characterize the various kinds of ſwellings which form in the cellular membrane, are by no means adequate; and tumors will be daily met with which it is impoſſible to aſſign to one or other of theſe ſpecies. This ſubject therefore ſtill remains open for the inveſtigation of future inquiry. And it is probable, that when the ſubject is better underſtood, the ſurgeon will not on all occaſions be obliged to have recourſe to the knife; and that he will be able to diſtinguiſh thoſe which may be allowed to remain, or as harmleſs treated by external applications, from thoſe whoſe nature is more malignant, and require an early extirpation.

Treatment.—When ſarcomatous tumors are painful and tender to the touch, advantage may be had by local blood-letting, either by leeches or cupping. Fomenting the parts with a decoction of chamomile flowers or poppy heads, and applying a ſolution of muriate of ammonia or of vinegar, and acetate of lead, are alſo uſeful in diminiſhing their bulk. Frictions with unctuous ſubſtances, as mercurial ointment and camphor; camporated ſpirits, aqua ammonia and oil; tincture of cantharides—have been uſed for the diſcuſſion of indolent ſwellings: Soap and mercurial plaſters have been alſo much commended by ſome; but of all theſe remedies perhaps there is none more uſeful than friction with the dry hand. The mode by which this practice is to be conducted is particularly mentioned under *Swellings of the Joint*. While we employ theſe applications to the tumor, we ought alſo to preſcribe purgative medicines every ſecond or third day, enjoin an abſtemious diet and reſt. An alterative courſe of medicine is alſo ſuppoſed to be uſeful. Small doſes of calomel or corroſive ſublimate are given for this purpoſe. The extract of hyoſcyamus and calomel, or calomel and the extract of cicuta, has been much extolled by ſome. 34

By cauſtic.—Some ſurgeons (and it is a favourite practice with all itinerants) have attempted to remove tumors with cauſtic; and though this mode is much more painful and more clumſy than the knife, yet there are ſome caſes, where, either from the tumor being ſo ſituated, or from the patient being timorous, this practice may be reſorted to. 35

Where a tumor is to be removed by cauſtics, the common cauſtic potaſs will anſwer the purpoſe extremely well. This is to be placed over a ſufficient bulk of the ſkin, and allowed to remain longer or ſhorter according to the depth of the tumor, and the portion of it intended to be removed. After the dead portion has ſeparated by the aſſiſtance of poultices, &c. the cauſtic may be again renewed until the whole maſs is deſtroyed. Equal parts of red precipitate and burnt alum forms a very active cauſtic, and is uſed by ſome; but it creates great pain. By mixing opium with the cauſtics, the pain has been alleviated.

By inciſion.—When a ſarcomatous tumor is to be removed by inciſion, the ſurgeon ſhould always keep in remembrance, that whilſt the tumor is growing, the contiguous cellular membrane is generally condenſed, and is formed into a kind of capſule. A knowledge of this not only renders the extirpation of the tumor much eaſier, but tumors may be cut out from a depth, and from connexions, apparently dangerous. The integuments are to be freely divided, and the inciſion carried down to the capſule of the tumor, before we attempt to diſſect it from the contiguous parts; if this be not done, the diſſection becomes more tedious and difficult, and more blood is loſt than what was neceſſary, from veſſels being divided which might have been ſaved; and if the tumor happen to be deeply ſeated, its extirpation even becomes impracticable. The general directions given for the extirpation and after treatment of encyſted tumors may alſo be applied to the ſarcomatous tumors. 36

SECT.

(c) Another ſpecies of ſarcoma has been termed the *oſteo ſarcoma*, from bony matter being formed in the tumor.

Oedema.

Sect. IX. *Of Oedema.*

37 Oedema consists in the effusion of a watery fluid in the cellular membrane of any part of the body.

The swelling in œdema is not circumscribed. The skin of the swollen part retains its natural colour, and sometimes becomes paler than natural, having a glossy hue. The part has a cold feeling; and pressure made by the point of the finger forms an impression or dimple, which remains for some time after the finger is removed, and disappears slowly. There is no acute pain, but there is an uneasiness or sense of weight and tightness in the part. If a limb be œdematous, the magnitude of the swelling is always increased or diminished, according as it is placed in a depending or horizontal posture. Oedema always arises from the want of proper balance in the functions of the exhalent and absorbent systems, and it appears both in a constitutional and local form. Contusions, sprains, the long use of relaxing poultices and washes, are often local causes of œdema. More or less œdema is conjoined with erysipelatous inflammation, and this sometimes terminates in gangrene. A part which has been acutely inflamed often remains œdematous for some time afterwards. It is also often owing to some impediment which prevents the return of the blood to the heart. Pressure of the gravid uterus on the iliac veins often renders the lower extremities œdematous. Aneurisms and other tumors, by compressing the veins of the extremity, often produce this affection. It also accompanies *ascites*, *hydrothorax*, &c. &c.

38 *Treatment.*—As an œdematous swelling is generally the effect of some other disease, the cure must depend upon the original disease being removed.

If the limb be the part affected, it should be kept in a horizontal position. Frictions made on the part with flannel, and a moderately tight roller, applied from the toes upwards, have a powerful effect in diminishing the swelling. The operation of these means is to be assisted by giving purgatives and diaphoretics. See Medicine.

If the tumor become so tense as to create much pain and inflammation of the skin, these are better moderated by the discharge of the fluid by means of a small puncture, than to allow the integuments to burst. A puncture is, however, not void of danger, for wounds in dropsical constitutions generally excite a great degree of inflammation, and are apt to become gangrenous. The puncture should be made upon the most prominent parts of the swelling with the point of a lancet; and as the fluid which oozes out is apt to create great irritation of the tender skin over which it flows, it is a proper and very useful precaution to keep the skin always covered with some unctuous adhesive substance. For this purpose the *unguentum resinosum* is very well calculated.

39 Sect. X. *Of Emphysema.*

Emphysema consists in an effusion of air into the cellular membrane of any part of the body.

The swelling is without pain, and colourless; and it is easily distinguished from œdema, by the noise and particular feeling it has when pressed upon. It then makes a crackling noise, and resembles the feeling created by pressing a dry thin bladder half filled with air. The swelling is not heavy. At its commencement, it only affects one part; but it soon spreads over the body, and distends the whole skin.

Emphysema generally arises from a wound of the lungs; often from a spicula of a broken rib *. It has also been known to arise from an ulceration in the lungs; but this seldom happens, as the inflammation attending the formation of the matter condenses the contiguous vesicles, and produces adhesions between the lungs and cavity of the thorax.

* See *Wounds of the Thorax.*

Emphysema has also been sometimes observed in some putrid diseases. Dr Huxham has recorded a case of this kind in a sailor who was attacked with putrid fever and sore throat †.

† *Medical Observations and Inquiries*, vol. i.

A partial emphysema has also been observed in cases of gangrene. Dr William Hunter has mentioned a case of that kind.

The treatment of emphysema must always depend on the nature of the original disease. It may be here, however, remarked, that the effused air is readily absorbed, and creates no inflammation or any change in the cellular structure where it had been effused.

Chap. II.

Of the Diseases of the Skin.

Sect. I. *General Remarks on the Pathology of the Skin.* 40

There are a considerable number of diseases which arise in the different parts which compose the skin; and there are others which seem to be the effect of that sympathy which the skin has with most organs of the body.

Of the diseases which attack the skin, there are five classes. In the first, the papillæ are affected; in the second, the cellular membrane contained in the areolæ of the skin; in the third, the rete mucosum or capillary net-work, from which the exhalents arise; in the fourth, the cutis vera or chorion; and in the fifth, the epidermis or scarf skin.

1. Under the diseases of the first class, or those of the papillæ, may be considered all those in which an alteration in the sensibility of the skin takes place. Whenever inflammation affects the skin, this alteration of sensibility is perceptible; and in some of the nervous diseases of women it is very remarkable; for on touching the skin a little roughly, convulsions are produced. It is also well known the effect of titillation on the skin; and perhaps an application of this knowledge might be extremely useful in the treatment of some diseases.

2. We have examples of the second class of diseases of the skin, where the areolæ of the cellular membrane of the cutis vera becomes inflamed, in boils and perhaps also in smallpox, and in some of those tumors commonly called pimples of the skin.

3. The rete mucosum, from its vascularity, is probably the seat of erysipelas, measles, scarlatina, and that multiplicity of eruptions to which the skin is subject.

4. In elephantiasis, cancer, &c. and in general in all chronic cutaneous diseases, the cutis vera is affected; it appears, however, to be seldom primarily affected in acute diseases.

5. The epidermis is passive in all the diseases of the skin, and is only affected by its continuity. Its sensibility

Diſeaſes of the Skin.

lity is never increaſed, nor is it ſuſceptible of being inflamed, and conſequently it never forms adheſions. Its internal ſurface, too, raiſed by a bliſter or any other means, and applied to the parts below, never reunites. The excreſcences which form on it, ſuch as corns, &c. are dry and inert, and without circulation; if they are painful, it ariſes alone from their preſſure on the nerves of the ſubjacent parts.

From all theſe different affections of the ſkin, a number of ſympathetic affections ariſe which it is worth while here to remark, though only a few of the diſeaſes of this organ come properly within the limits of a ſyſtem of ſurgery.

41 1. Every time that the papillæ are much excited in irritable people, as in titillation, various organs are ſympathetically affected by it. Sometimes it is the heart; hence follows fainting. Sometimes the ſtomach, and in two caſes mentioned by Bichât, the perſons vomited. Sometimes it is the brain, as is obſerved in people, where tickling brings on laughter, and even violent convulſions.

* *Bichât Anatomie Generale*, tom. iv. p. 730.

"Medical men," ſays Bichât*, "are often aſtoniſhed at the extraordinary effects which quacks produce on the body from the knowledge they have acquired of the ſympathies of the ſkin produced by titillation. But how ſhould we be more aſtoniſhed at this, than by vomiting produced by diſeaſes of the womb, than by diſeaſes of the liver being brought on from a injury of the brain, or by headaches ariſing from a diſordered ſtate of the gaſtric viſcera?" The influence of titillation of the ſkin may be of much uſe in the treatment of ſome diſeaſes. In hemiplegia, &c. would not the excitement of the ſoles of the feet, which have ſo much ſenſibility, as every one knows, not anſwer much better repeated ten or twelve times a day, than the application of a bliſter, the irritation of which continues only during a ſhort time.

From this ſympathy which the ſkin has with the diſtant organs, we may be perhaps able to explain ſatisfactorily the influence which friction has been lately found to have in ſome diſeaſes. Mr ———, an ingenious ſurgeon at Oxford, has employed this remedy to a very great extent in diſeaſes of the joints; and he has experienced from it the beſt effects†.

† *Treatment of the White Swelling of the Joints.*

2. Whenever the exhalents of the ſkin, or the exterior capillary ſyſtem from whence they ariſe, are affected in any manner, a number of other parts participate, and thence ariſes a ſecond order of ſympathies of the ſkin.

There are few organs which have more ſympathy with the ſkin than the ſtomach. The bath, which acts upon the ſkin, during digeſtion affects ſympathetically the ſtomach, and diſturbs its functions. When that organ is ſpaſmodically affected, it often is reſtored to a ſtate of health, by the influence it receives from the bath. Bichât mentions a caſe of a woman who was troubled with conſtant vomiting, in conſequence of ſuppreſſed menſes; and who was immediately relieved by the warm bath after other remedies had failed.

The action of cold on the ſkin produces a variety of ſympathetic effects; above all when that action takes place during perſpiration. It is alſo well known what a number of phænomena reſult from a ſudden diſappearance of many eruptions of the ſkin.

3. When the cellular membrane contained in the areolæ of the ſkin, becomes inflamed, as in boils, puſtules, &c. a number of ſympathies enſue, which may be referred to the cellular ſyſtem in general *.

4. The diſeaſes of the cutis vera and epidermis being all of a chronic nature, their ſympathetic affections have the ſame character, little more being known of them.

We have alſo mentioned, that beſides diſeaſes of the ſkin, ariſing from a change of ſtructure in that organ, there were alſo others which aroſe from the ſympathy it has with other organs. Whenever a cold body enters the ſtomach whilſt there is a perſpiration on the ſkin, the perſpiration inſtantly ſtops. The entry of warm drinks into the ſtomach, and an augmentation of the cutaneous exhalation, are two phenomena which coincide at the ſame moment, in ſuch a manner, that one cannot attribute the ſecond to the abſorption of the drink, to its paſſage to the venous blood through the lungs, and then to the arteries. The production of perſpiration is, therefore, analogous to the ſuppreſſion of it in the former inſtance. Hence will be found a great variety of phenomena in different diſeaſes, ariſing from the ſympathy exiſting between the ſkin and the other organs, various degrees of dryneſs, of moiſture, and of perſpiration. Sometimes theſe phenomena are chronic. In many organic diſeaſes, different kinds of tumors are formed on the ſkin, in the ſame manner as we obſerve *petechiæ*, miliary eruptions, &c. &c. produced in acute fevers; the difference being merely in the duration of the periods of the ſympathetic affections.

The diſeaſes of the ſkin form a very important claſs in a ſyſtem of noſology. There are, however, only a few which ought properly to be conſidered in a ſyſtem of ſurgery.

It is the ſeat of all eruptions, as ſmallpox, meaſles, and a vaſt number of other diſeaſes. It is liable to inflammation, ſuppuration, and gangrene. It is alſo ſubject to diſeaſes and injuries from its expoſure to the action of external bodies, and from ſerving as a defence to the internal parts, It is alſo ſubject to cancer, warts, and other excreſcences, the treatment of which more properly belong to the ſurgeon.

Sect. II. *Of the Erysipelas, or the Roſe.* 42

The roſe is ſometimes a local diſeaſe; at other times it is merely a ſymptom of ſome other affection. It differs from all other inflammations in the peculiar ſhade of red colour, and it is alſo remarkable for the diſorder which it generally creates throughout the whole ſyſtem. The part of the ſkin which is affected becomes of a bright ſcarlet colour, with a tinge of yellow; and towards the termination of the complaint, the yellow becomes more diſcernible. Beſides the difference in the ſhade of red, the ſwelling is neither ſo hard, ſo elevated, nor ſo circumſcribed as that of phlegmon. The ſkin has a gloſſy ſmooth appearance, a burning heat, and on its being touched with the finger, the ſcarlet colour diſappears where the preſſure is made, leaving a white ſpot, which, however, is almoſt immediately replaced when the finger is removed. The pain attending the diſeaſe is ſometimes very great; there is alſo always more or leſs ſwelling of the parts affected and thoſe in the immediate vicinity; and this ſeems chiefly to ariſe from a watery effuſion in the cellular membrane.

The roſe is very apt to ſpread rapidly to a great extent;

Eryſipelas. tent; and it frequently changes its ſituation, growing gradually well in one ſide, and extending itſelf on the other. Sometimes it diſappears entirely at one place, and attacks ſome other. As the diſeaſe gets well, the cuticle peels off from the affected part.

Eryſipelas may be combined with phlegmon (eryſipelas phlegmonoides), in which caſe the inflammation is of a deeper red colour; the ſwelling is alſo greater and deeper, and the pain is more acute. There is alſo a throbbing in the part, and the pulſe is full and hard.

There is alſo a particular ſpecies of eryſipelas called *St Anthony's fire*, in which ſmall veſicles are formed on different parts of the ſkin. Theſe burſt, and diſcharge a thin fluid which forms a ſcab, and beneath the ſcab ſuppuration ſometimes takes place.

The true eryſipelatous inflammation ſeldom ſuppurates, but generally terminates by reſolution; very violent caſes ſometimes cauſe gangrene.

When eryſipelas is accompanied with inflammation of the cellular membrane, as there are no diſtinct limits of the diſeaſe, the matter which is formed in thoſe caſes which advance to ſuppuration, often extends very far in every direction, and ſometimes produces very conſiderable ſloughing, not only of the cellular ſubſtance, but of the faſciæ and tendons beneath the ſkin. Eryſipelas is generally accompanied with all the ſymptoms of general fever, and theſe occur in a very conſiderable degree, even where the external inflammation is extremely ſlight. Languor, laſſitude, wearineſs in the limbs, headach, loſs of appetite, oppreſſion about the ſtomach, precede the appearance of the local complaint. The moſt violent form of eryſipelas is moſt frequently ſeen attacking the face, producing a great deal of general fever, often accompanied with delirium; and in a few caſes we have known it to proceed ſo far as to inflame and ſuppurate the membranes of the brain. Eryſipelas ſeems to be intimately connected with the ſtate of the general conſtitution. Perſons in the habit of drunkenneſs and other ſpecies of intemperance, and who, when in a ſtate of intoxication meet with local injuries, often have eryſipelatous inflammation in conſequence of theſe. In general, eryſipelas has its principal ſource in a diſordered ſtate of the chylopoetic viſcera, and the wrong ſtate of the bilious ſecretion. It ſeems alſo to be often connected with a ſuppreſſion of perſpiration, for it never recedes until that ſymptom is relieved.

43 *Of the treatment of Eryſipelas.*—The mild eryſipelas is to be relieved by the exhibition of gentle diaphoretics. A few doſes of nitre, in order to promote the ordinary evacuations, and the general attention to the antiphlogiſtic regimen.

It is alſo of great importance to attend to the ſtate of the bowels, and to give purgative medicines, both with a view of removing any feculent matter contained in them, and as a general evacuant.

When the caſe is conjoined with phlegmon, and when there are ſtrong ſymptoms of inflammatory fever, veneſection becomes neceſſary; and this is particularly the caſe when the face is the ſeat of the diſeaſe. Copious bleeding, however, is generally hurtful, and no blood ought ever to be taken away when the functions of the abdominal viſcera are much diſordered.

When the patient has a very foul tongue, a bitter taſte in his mouth, and a propenſity to vomit; if theſe ſymptoms cannot be removed, purgatives and emetics become neceſſary. Indeed, in almoſt all ſevere caſes, an emetic is indicated, and ought even to be repeated, ſhould the ſymptoms remain ſevere. Eryſipelas.

There has been a great variety of opinions with regard to the external treatment of eryſipelas; ſome recommending the part to be kept dry, of a moderate warmth, and excluded from the air: others have uſed warm or cold moiſt applications. The practice of Deſſault is perhaps the moſt judicious. In thoſe caſes of eryſipelas which were produced from an internal cauſe, no topical application is to be employed, except, perhaps, duſting the part with flour; but when any ſpecies of eryſipelas ſucceeds a contuſion, a wound or an ulcer, the regimen and internal medicines are inſufficient, if proper topical remedies are not at the ſame time employed to alleviate the local irritation. In this point of view Deſſault employed poultices, the good effects of which in theſe ſort of caſes were confirmed by numerous obſervations. He conſidered it, however, as an eſſential precaution not to extend this topical application further than the bruiſed part, or the edge of the wound or ulcer. If any application is made to the eryſipelatous ſurface, it ought to conſiſt merely of a weak aſtringent ſolution: that which was always employed at the Hotel Dieu, conſiſted of a ſcruple of the extract of lead in a pint of water.

Sect. III. *Of the Farunculus or Boil.* 44

The farunculus appears to be an inflammation of the cellular membrane of the areola of the chorion; the other inflammations of the ſkin and cutaneous eruptions being ſeated on the *corpus reticulare.* The farunculus is a circumſcribed, very prominent, and hard tumor, of a deep red colour; and they vary, from the ſize of a pea to that of a pigeon's egg. They are extremely painful, and are ſeldom attended with fever. They are alſo moſt frequent in young people. Boils generally paſs into a more or leſs perfect kind of ſuppuration; a ſmall white ſpot is formed on the apex of the tumor, which, when it has reached the ſkin, diſcharges but a ſmall quantity of pus in proportion to the bulk of the ſwelling. Before the tumor begins to ſubſide, a yellow ſlough, formed by a portion of dead cellular membrane, comes out.

As ſwellings of this kind almoſt always ſuppurate, and as induration conſtantly remains after an incomplete reſolution of them, we ought to promote ſuppuration by uſing emollient applications. Emollient poultices are beſt for this purpoſe. When a quantity of matter is collected, it is ſometimes advantageous to open the boil with the point of a lancet, then to allow it to remain until the ſkin ulcerates. Gentle aperients and antiphlogiſtic regimen ought not to be omitted.

Sect. IV. *Of the Chilblain.* 45

The chilblain is a painful, and very often an extremely itchy ſwelling of the ſkin of an extreme part of the body, in conſequence of expoſure to extreme cold, or ſudden change from a very cold to a warmer atmoſphere.

Chilblains are moſt frequent in young people of ſcrofulous conſtitutions, and in this country the diſeaſe is moſt prevalent during the winter months. It appears

moſt

Chilblain.

most commonly on the toes and heels, and sometimes also on the fingers, and parts where the circulation is most languid.

The first symptoms of the disease are a paleness of the part, which is quickly succeeded by more or less redness, a very troublesome itching, and sometimes pain. The skin gradually acquires a purple hue; the part swells, and the cuticle separates from a serous effusion which takes place below it. Beneath the cuticle an ulcer appears of a very irritable appearance, and accompanied with great pain. This ulcer spreads rapidly, has very acute edges, and its surface is of a dark or rather dirty yellow colour. Sometimes the ulceration penetrates as low as the tendons, or even exposes the surface of the bones, producing a sphacelation of an extremity.

In the treatment of chilblains, before the skin has ulcerated, the principal attention ought to be paid in keeping the affected part of an equal temperature, and to rub it over with stimulating applications. Camphorated spirit, spirit of turpentine, &c. have been generally recommended for this purpose; but we have found the tincture of catharides, properly diluted, to be much more efficacious. A drachm of this tincture to an ounce of the tincture of soap, will be generally found to answer extremely well; and this is to be rubbed on the part once or twice a day.

When vesications begin to appear, and ulceration has taken place, emollient poultices should be employed; but after this process has gone on a certain time, and the pain and irritation abated, much benefit will be experienced by the application of the red precipitate ointment to the ulcers. Under this treatment we have repeatedly observed large ulcers of this kind heal with unusual rapidity.

Rest and a plain nourishing diet will be commonly best suited to people with chilblains; and should symptoms of debility and a sloughing of the sore ensue, it may be even necessary to give freely wine and bark.

46

Sect. V. *Of Cancer of the Skin.*

The skin is frequently attacked with cancer. That of the face is more particularly exposed to it; and this no doubt arises from its delicacy, from the great number of vessels which penetrate it, and perhaps also from its more frequent exposure than any other part of the body to external irritations. Cancer, however, is not confined to the skin of the face; it frequently appears on the back of the hands, and on the feet. Wiseman has seen it on the cranium, Gooch on the inside of the thigh, Richter at the umbilicus; and we have seen an example of it in the skin above the pubes.

When cancer affects the skin, it begins in the form of a small, hard, and dark-coloured wart, which increases very slowly in size; the contiguous skin becomes hardened, forming a stool or button around the wart. The progress of the disease in the skin has been always observed to be more slow than cancer in any other part; so that it often remains in the form of a black scab for many years. The scab at last separates, and then an ulcer of the skin is exposed, having all the characters of the true cancerous sore. It has a pale colour, ragged hard edges, and unequal surface; and it gradually extends in an irregular manner along the skin; the hard tumor which forms its basis, at the same time increasing in size. Instead of pus, the ulcer discharges a thin ichor, which reddens and excoriates the adjacent skin. The disease which, when in the form of a scab gave little uneasiness, now becomes painful; and the patient feels more or less frequently sharp lancinating pains darting through the tumor, and extending from it to the adjacent soft parts.

Cancer of the Skin.

When a cancerous affection of the skin is examined after it is removed from the body, it has all the leading characters we have described in our general observations on cancer*. The great degree of hardness of the morbid mass, is produced from the formation of the hard fibrous-looking matter observed in all schirrous tumors; and the direction of its fibres will be generally found extending from the base of the tumor to the surface of the skin.

* See chap. on Cancer.

Cancer of the skin follows the same progress as cancerous affections of other textures; the contiguous glands become enlarged and ulcerate; and both the ulcers which these form, and the primary one, spread over whatever parts they meet, till they destroy the patient.

Treatment.—The success which has been attributed to various medicines, particularly to arsenic and strong corrosive applications, in the cure of cancer, has been chiefly from the use of these medicines in cancerous affections of the skin. From the disease being observed in the skin before it has far advanced, from its slow progress in that part, and the ready application of remedies, it affords better opportunities of experiment than other parts of the body when affected with that disease. Past experience, however, leaves us but little room to hope for a cure of cancer in the skin by any external application with which we are as yet acquainted; and we know of no remedy to be trusted to but the complete excision of the diseased parts. 47

The more early the diseased skin is removed, the greater is the chance of a permanent cure of the disease. And in whatever part of the body the skin is affected, it is of the utmost importance to remove every part where there is the least suspicion of contamination. In the face, we have often observed the surgeon too anxious to save skin, with a view of lessening the blemish of an extensive scar; but in a disease so deporable as cancer, no object of this kind can in any degree compensate for being exposed to the smallest risk of its return; the more so, especially as we have often remarked that a second operation is seldom if ever attended with permanent advantage. The surgeon, therefore, ought to lay it down as a general rule, to include in his incision a considerable portion of the sound skin surrounding the diseased parts.

The particular cases wherein an operation is advisable, must be left entirely to the judgement of the surgeon. The operation may be performed in all cases where the diseased parts appear to be within the reach of the knife; or if there are any glands affected, if these can be safely removed, it may be even under these circumstances undertaken, though no doubt the chance of a return of the disease in such cases is greater.

Whenever the periosteum and parts surrounding any of the bones is affected, there is little chance from any assistance of art, except when the disease occurs in the extremities of the body, as in the hands or feet; for in such cases, amputation of the whole member may be performed.

When

Cancer of the Skin.

When cancerous ſores appear about the eyelids, and ſpread along the *conjunctiva*, covering the eyeball, it is the only ſafe practice to remove the whole contents of the orbit. The different parts which compoſe the eyeball and its appendages, ſeem to have ſuch a cloſe connection with one another, that it is difficult, perhaps impoſſible, to mark the boundaries of the diſeaſed action which is going on; and as the loſs of any part of the organ prevents the others from performing their functions, it becomes no material object to ſave any particular part.

It is generally remarked, that the lips are particularly ſubject to cancer, at leaſt in men; and that the under lip is more ſo than the upper one. The diſeaſed part may be removed in this part of the body with great neatneſs upon the general principles of the operation of harelip. This can only be done when the diſeaſed portion is ſmall, and may be included by two inciſions forming an angle, inclining towards the chin. See HARELIP. When, however, the diſeaſe has ſpread over a conſiderable portion of the lip, ſo as to prevent the ſound parts from being united: after the diſeaſed parts have been removed, all that can be done is to remove the parts affected, ſecure the bleeding veſſels, and dreſs the ſore like any other recent wound.

By a little ingenuity and contrivance, much may be ſometimes done in making the inciſion in ſuch a manner as to allow the ſound parts to be afterwards brought together and united; ſo that in all caſes of extenſive diſeaſe, the ſurgeon ſhould conſider of all the different modes by which the diſeaſed parts may be removed with moſt advantage.

The operation is performed by ſome with a common ſcalpel, by others with ſciſſars. When the ſcalpel is uſed, the lip is to be held firmly with forceps by an aſſiſtant, and the ſecond inciſion made along their edge; but when the diſeaſe extends beyond the adheſion of the lip to the jaw, no forceps are neceſſary.

The ſciſſars are, however, the preferable inſtrument; they divide the lip with much leſs pain, and with a mathematical preciſion. When they are uſed for this purpoſe, it is neceſſary they be made thick and ſtrong; and as in ſome people the lip is extremely thick, and apt to ſlip through the blades, inſtead of being divided. Giving the cutting edge of the blades a circular form will be found to be an improvement on the common ſtraight edge. It is evident, however, that the ſciſſars can only be employed in thoſe caſes where the forceps could be uſed to aid the knife. All wounds of the lip heal beſt and moſt accurately with the twiſted ſuture; ſo that the edges ſhould be brought together in the ſame manner as has been recommended in the caſe of harelip, and the ſame mode of after-treatment is alſo to be purſued.

43 SECT. VI. *Of Warts.*

There are two kinds of warts which grow upon the ſurface of the body; the one ſpecies is connected with the ſkin by a broad baſe; is of a hard, firm texture, unequal in the ſurface, and free from pain. Warts of this deſcription are frequent in young people, and are generally found on the hands.

The other ſpecies of wart is attached to the ſkin by a ſlender pedicle; they have a very unequal ſurface, appearing as if compoſed of an aggregate of ſmall tumors. Warts of this kind ſeldom attain any very conſiderable ſize, the largeſt ſcarcely exceeding that of a pea. They are ſeldom troubleſome; but in ſome ſituations they become extremely irritable, and produce, eſpecially when injured, very diſagreeable ſenſations. Warts.

This ſpecies of wart is moſt frequently met with on the prepuce and glans of the penis; on the labiæ; around the anus, and alſo frequently upon the hairy ſcalp. In theſe ſituations they ſometimes acquire a very large ſize, numerous warts ariſing over the whole ſurface, and forming a maſs of a cauliflower appearance. They are moſt frequent in people advanced in life, and are often connected with the venereal diſeaſe.

Beſides theſe, there are varieties of ſmall warts which occur in different parts of the body, which have not been accurately deſcribed by authors. There is one variety where a number of ſmall, whitiſh tumors appear in ſome parts of the face of children; theſe contain an opaque white fluid, which when diſcharged, and allowed to remain upon the contiguous ſkin, contaminates it, and produces warts of the ſame deſcription.

Of the treatment of Warts.—A variety of local remedies have been applied, both by medical men and the vulgar, for the curing of warts; and theſe generally poſſeſs a corroſive quality. 49

Lunar cauſtic is one of thoſe which generally anſwers beſt, and is moſt eaſily managed for deſtroying the firſt ſpecies of warts which we have deſcribed. A ſaturnine ſolution applied to the warts three or four times a day, or *aqua ammoniæ*, and tincture of cantharides, have alſo been found beneficial in promoting their abſorption.

In the ſecond ſpecies, when the excreſcences are very large, they ſhould always be removed along with a portion of the adjacent ſkin, by the knife. In thoſe caſes where the warts are very numerous, and where, from their ſituation, it becomes impoſſible to remove them with the knife, equal portions of *ærugo æris* and ſavine powder, or ſavine powder alone, will be found ſometimes to ſucceed in removing them. In ſome caſes, particularly where the warts are ſituated about the glans of the penis, we have found a ſaturated ſolution of the muriate of mercury in ſpirit of wine, completely anſwer the purpoſe. In thoſe caſes connected with ſyphilis, beſides local applications, it is neceſſary to uſe mercury. Sometimes, indeed, the warts drop off whenever the mercury begins to affect the conſtitution.

SECT. VII. *Of Corns.* 50

A corn is a peculiar hardneſs of the epidermis, which ſometimes extends to the ſubjacent ſkin. In the firſt caſe, the diſeaſed part is removeable; in the ſecond caſe it is more fixed. It frequently elevates itſelf above the ſkin, and is not unlike one ſpecies of wart. It is hard, dry, and inſenſible, except when preſſed upon the contiguous parts; and it reſembles in colour and appearance the thickened cuticle on the hands of workmen. Corns commonly are formed on the toes and ſides of the feet, and they are generally owing to the wearing of tight ſhoes. Sometimes corns do not occaſion the leaſt inconveniency; but in other inſtances they occaſion ſo much

Corns.

much pain, that the patient can walk with difficulty. Corns are generally more painful in warm than in cold weather. The pain ſeems to ariſe from an inflamed ſtate of the parts in the circumference of the corn, which ſtate is excited and kept up by the preſſure of the induration, and not from any ſenſibility in the corn itſelf. They are more painful in dry than in moiſt weather, becauſe they become much more hard and dry.

51 *Treatment of Corns.*—The pain and difficulty of walking produced by corns, may be alleviated by immerſing them in warm water, and with a ſharp inſtrument cutting off their external layers; much relief will alſo be found by covering the part with a piece of adheſive plaſter, and by being careful not to wear ſhoes which are too tight. But what we have found a moſt complete cure for corns, is the application of one or other of thoſe corroſive ſubſtances which were mentioned for the treatment of warts. The lunar cauſtic, or the ſaturated ſolution of muriate of mercury in ſpirit of wine, ought to be preferred. They may be applied once every ſecond or third day, until the abſorption of the corn be completed; and before uſing them, it will be found proper to pare off ſome of the external hard layers of the corn.

Some corn-operators extirpate the corn by a ſharp inſtrument; but this only proves a palliative treatment, for ſooner or later a hard ſubſtance is again depoſited.

Sect. VIII. *Of Nævi Materni.*

52 Nævi materni are thoſe marks which frequently appear upon the bodies of children at birth, and which are ſuppoſed to originate from impreſſions made on the mind of the mother during pregnancy. They are of various forms; their colour is likewiſe various, though moſt frequently reſembling that of claret or port-wine. Many of theſe marks are perfectly flat, and never riſe above the level of the ſkin: theſe do not require the aſſiſtance of ſurgery; but in ſome caſes they appear in the form of ſmall protuberances, which frequently increaſe to a great ſize in the courſe of a few months. They appear to be ſoft and fleſhy; of a cellular texture, the cells containing liquid blood. They may be removed with little danger when not involving any important organ. They are ſupplied indeed more plentifully with blood than moſt other tumors are; and even ſometimes they appear to be entirely formed of a congeries of ſmall blood-veſſels; but the arteries which ſupply them may be, for the moſt part, eaſily ſecured by ligature. An operation ſhould never be long delayed; for as the ſize of the veſſels correſponds with that of the tumor, they ſometimes are ſo large as to throw out a good deal of blood before they can be ſecured. In performing it, the tumor is to be cut out, the arteries taken up, and the remaining ſkin brought as well together as the nature of the part will allow, and kept ſo by adheſive plaſter or ſuture.

If the whole tumor be removed, little hæmorrhagy generally follows; but if the ſmalleſt portion of the diſeaſed veſſels remain, not only a troubleſome bleeding follows, but the tumor is quickly reproduced by an increaſed exuberance. Tumors of this kind have been alſo removed by ulceration excited by the application of corroſive ſubſtances; and a knowledge of this circumſtance might be in ſome caſes of practical application.

Chap. III.

On the Diſeaſes of Mucous Membranes.

Diſeaſes of the Mucous Membranes.

Sect. I. *General Remarks on the Pathology of the Mucous Membranes.* 53

Though at firſt ſight it may appear that the mucous membranes are very conſiderable in number, yet when they are viewed more generally, they appear much more limited; and we will find that in whatever part of the body they be found, they are ſubject to the ſame morbid alterations of ſtructure.

The ingenious Bichât has ſhown that there are two *general* mucous ſurfaces, of which the others are all portions. The one penetrates into the interior of the mouth, the noſe, and the anterior ſurface of the eye. After lining theſe two firſt cavities, it is prolonged into the excretory ducts of the parotids, and ſubmaxillary glands. It paſſes into all the ſinuſes, forms the conjunctiva, enters the lachrymal points, the naſal canal, the lachrymal ſac, and is continued into the noſe. It lines the pharynx and euſtachian tube, the trachea and bronchiæ. It goes down the œſophagus into the ſtomach, and paſſes along the whole inteſtinal canal till it joins with the ſkin at the extremity of the rectum. This he calls the *gaſtro-pulmonary mucous ſurface.*

The other general mucous ſurface, the *genito-urinary*, begins in the male at the urethra; paſſes along that canal into the bladder, lines the bladder, veſiculæ ſeminales, and vaſa deferentia, along with their numerous branches. It alſo extends into the excretories of the proſtate gland, the ureters, and the pelvis of the kidneys.

In the female it begins at the vulva, penetrates the ureter, and paſſes as in the male over the urinary organs. It alſo enters the vagina, lines the womb and fallopian tubes, and is then continued with the peritoneum. This is the only example of a communication eſtabliſhed between the mucous and ſerous ſurfaces.

This view of the extenſion of the mucous membranes is ſtrongly exemplified by an examination of their diſeaſes; for it will appear that there is not only an analogy between the different portions of the firſt, by an affection of the whole parts over which it extends, but there is alſo a line of demarkation between the two, from the one remaining ſound whilſt the other is affected throughout. This laſt circumſtance is confirmed in the hiſtory of many epidemic catarrhs; one of theſe membranes having been obſerved affected throughout, whilſt the other remained unchanged. The epidemic obſerved at Paris in the year 1780 had this character. "This epidemic (ſays Pinel *) which was very general in Paris, and with which I was myſelf attacked, was remarkable; for it affected almoſt the whole mucous membranes, that of the trachea and bronchiæ, the conjunctiva, the pituitary membrane, the palate, the pharynx, and the alimentary canal." The epidemic catarrh of 1752, deſcribed in the Memoirs of the Medical Society of Edinburgh, is an example of the ſame kind; for in all theſe, the mucous membrane lining the urinary and genital organs remained unaffected.

* *Noſographie Philoſophique*, tom. ii. p. 208.

We alſo obſerve that an irritation of any part of a mucous membrane frequently creates a pain on a part of the membrane which was not irritated. Thus a calculus

Inflammation of Mucous Membranes.

culus in the urinary bladder produces the chief pain at the point of the penis, and the preſſure of worms in the inteſtines produces an itching at the noſe.

Among theſe phenomena, which are purely ſympathetic, it is ſeldom that a partial irritation of one of the mucous ſurfaces produces pain in any part of the other. The ſingular connection which ſubſiſts between the membranes of the uterus and bronchiæ in mucous hæmorrhagies, however, is an example of this kind. If the blood accidentally ceaſe to flow from the one during menſtruation, the other frequently ſupplies the functions of the firſt, and exhales it. In caſes of ſtricture, or thickening and diſorganization of the mucous membranes of the urethra, the ſtomach is ſometimes affected: this may alſo ariſe from the ſympathy of the two mucous membranes.

Mucous membranes, from being conſtantly expoſed to the action of the external air, or to the contact of extraneous ſubſtances, do not ſuffer, when diſplaced, like other parts of the animal economy. In a prolapſus of the uterus or rectum, their mucous ſurfaces ſerve all the purpoſes of ſkin; and ſurrounding bodies do not produce more pain on them than on common ſkin. This is very different from the effects produced on opening a *ſerous* cavity or a capſule of any joint. The cellular, muſcular, nervous, glandular, and other ſyſtems, when laid open, preſent alſo very different phenomena.

The mucous membrane, like the ſkin, is organiſed in ſuch a manner as to endure with impunity the contact of external bodies; theſe merely producing an increaſed ſecretion of thin mucus. A ſound introduced and retained in the bladder produces no alteration in the ſtructure of the mucous membrane of the urethra; and for the ſame reaſon, a ſtyle or tube can be kept in the lachrymal duct without cauſing any irritation.

Moſt of the diſeaſes of mucous membranes come within the province of the ſurgeon; the others have been already treated of under the article MEDICINE.

54 SECT. II. *Inflammation of Mucous Membranes.*

The contact of extraneous and irritating ſubſtances, acrid vapours, or the ſudden expoſure to cold air of any mucous ſurface, is often followed by ſome degree of inflammation.

A preternatural degree of redneſs is a conſtant ſymptom of inflammation in moſt parts of the body; but the moſt remarkable character of inflammation in mucous membranes, and that which diſtinguiſhes it from all others, is the ſecretion of a puriform fluid. The mucus, which in the natural ſtate is nearly tranſparent, and merely moiſtens the ſurface, becomes of a yellow colour, and the quantity is ſo abundant as to form a purulent diſcharge. It is from the ſuſceptibility of the mucous glands to be acted upon by any irritation which is applied to the extremities of their ducts, that the ſtone or any tumor in the bladder, polypi of the noſe or vagina, are always accompanied by a profuſe diſcharge.

The inflammation is accompanied with a more or leſs degree of thickening of the membrane; and ſometimes this remains after all the inflammatory ſymptoms ceaſe. The abatement of the inflammation is marked by an increaſe in the thickneſs of the diſcharge and a diminution in its quantity.

Gonorrhœa

We have an example of inflammation affecting the mucous membrane of the noſe in coryza, the ear in otitis, the urethra and vagina in gonorrhœa, the bladder in a catarrhus veſicæ, and the eye in the puriform ophthalmia, the lachrymal ſac or duct in fiſtula lacrymalis. In all theſe diſeaſes the ſymptoms have a ſtriking analogy, and are varied only from the difference in the functions of the particular organ, the mucous covering of which has been affected.

During life, mucous membranes become gangrenous much more ſeldom than the ſkin. This is proved from the conſequences of catarrh, compared with thoſe of eryſipelas. There are, however, caſes where this texture dies, whilſt thoſe adjacent continue to live; as in malignant angina.

SECT. III. *Of the Inflammation of the Mucous Membrane of the Urethra.*

55 Gonorrhœa (*Ecoulement Muceux*).

The term gonorrhœa is employed to ſignify a diſcharge of puriform matter from the orifice of the urethra or prepuce in men, and from the vagina in women; whether it proceed from a ſyphilitic or any other irritating cauſe.

The gonorrhœa may be defined a diſcharge of a contagious, puriform fluid, which comes from the mucous glands of the urethra, and membrane which lines that canal; or from the glans in men, and the interior of the genital organs in women. The diſeaſe ſeems to be produced by a *virus ſui generis*.

This diſeaſe generally makes its appearance in three or four days, ſometimes in ſix, but rarely later, after impure coition, with the following ſymptoms. The patient finds a particular itching and diſagreeable ſenſation at the point of the yard, and a ſort of ſlight itching alſo at the part of the urethra placed immediately under the frenum. This laſts one or two days, and on the following days the orifice of the urethra becomes ſenſible and red; it alſo ſwells, and a limpid matter of a clear yellow colour flows from it, which tinges the linen. Whilſt the flow of this matter continues, the titillation becomes ſtronger and more painful, particularly in making water; for this leaves a burning impreſſion and ſharp pain in the affected part. In ſome individuals the firſt ſymptom preſenting itſelf is the diſcharge of a thick mucus. In theſe caſes the patient feels from the commencement a burning and painful ſenſation in making water. Theſe ſymptoms generally increaſe in three or four days. Sometimes, however, that does not ſenſibly happen till after eight or twelve days. The glans acquires a deep red livid colour; the diſcharge through it increaſes, and the matter becomes of a yellow, or greeniſh yellow colour, reſembling pus diluted. The ſwelling of the glans, and alſo of the whole penis, becomes conſiderable; the patient has frequently a deſire to make water, and he finds, particularly when he has remained for ſome time in bed lying on his back, frequent and involuntary erections, and ſo painful that they diſturb his ſleep, and oblige him to riſe out of bed.

Such is uſually the progreſs of the diſeaſe when the inflammation is ſimple, ſlight, and ſuperficial; but in many caſes the inflammation extends farther and penetrates more deeply, affecting the reticular ſubſtances of the

cavernous

Gonorrhœa. cavernous bodies of the urethra. Then the pain becomes excessive during erections, and the frenum of the glans is drawn downwards as by a cord, in such a manner that the body of the penis is forced upwards by the violence of the erection. It is this which is called *cordee*. It sometimes happens, that in this state the vessels of the urethra are torn, and thus occasion considerable hæmorrhagy. At other times, the discharged matter is mixed with streaks of blood; the prepuce is also so much inflamed and swelled that it cannot be pulled back over the glans, or if it has been pulled back, it cannot be again brought forward. In some cases the strangulation which accompanies this last accident, produces a mortification of the glans, and even occasions the death of the patient; this, however, seldom happens.

In some persons one or more of the inguinal glands swell, become painful, and are attended with symptomatic fever. Often the glands of the penis swell also, a cord or knots can be felt on the back of the penis, and the skin is also swelled and painful. Besides these symptoms, the patient often feels, either from his own fault, or on account of bad treatment, a particular uneasy aching sensation, with tension and swelling of the spermatic cord and testicles, accompanied with a diminution, or even a complete suppression of the discharge by the urethra. In other cases the disease makes greater progress; the irritation and inflammation stretching along the canal of the urethra. All the symptoms then become more violent, the pain which is felt in the perinæum or behind it, in making water, is so violent, that the patient is afraid to make the attempt, at the same time that he is frequently solicited by the fatiguing titillation at the neck of the bladder and anus. There is a perpetual desire to let off the water, whilst he can make no more than a few drops at a time with a burning pain. The whole canal of the urethra is swelled, and in a state of tension; the patient has frequent erections, and lancinating pains along the whole length of the canal, through the perinæum and anus. He cannot lie down for a long time, nor can he rest seated. In this state the swelling of the glands of the urethra, and the spasmodic contraction of its internal membrane, obstruct the free passage of the urine, and allow it to flow in a very thin bifurcated stream, or drop by drop; and if at the same time the discharge diminish considerably, or totally stop, a complete suppression of urine sometimes succeeds, occasioned by the inflammation and stricture of the neck of the bladder, or by the inflammation and swelling of the prostate gland and adjacent parts.

It sometimes happens that the inflammation of the urethra becomes so violent, that its internal surface, and the orifices of the glands which line it, secrete nothing; the same as we observe sometimes happens in inflammation of the mucous membrane of the nose and of the lungs. It is this state of the disease which some authors have described under the name of *gonorrhœa sicca*.

After these symptoms have continued with more or less violence, or when they have increased during one, two, or three weeks, or even during six or seven, according to the treatment employed, they begin gradually to diminish. The difficulty and the frequent desire to make water cease; the erections are no longer painful; the matter acquires more consistence, and forms into threads between the fingers, and at last the discharge entirely disappears. In other cases, and these the most frequent, the inflammatory symptoms disappear by degrees; but the discharge remains during weeks, months, or even years. It is this form of the disease which is called *gleet*, or simply *blennorrhœa*. Gonorrhœa.

Sometimes the inflammatory symptoms disappear by degrees, and leave behind them in the urethra an ulcer, from which there is a malignant and purulent discharge, and which occasions an affection of the system. This is what has been called *gonorrhœa complicata* or *ulcerosa*; but it occurs rarely.

In other cases a contraction remains in the urethra; sometimes a paraphymosis continues, and sometimes there is a tumor of the testicles, a hardening of these parts or of some of the glands of the urethra, an inflammation of the prostate gland, with a more or less complete suppression of urine; at other times, though very rarely, the discharge, when suppressed, produces suddenly a perfect deafness, or most violent ophthalmia*.

The exciting cause of syphilitic gonorrhœa is always the application of the specific virus to some part of the mucous membrane lining the urethra. The contagious fluid, applied to any part of the body of a sound person, acts with more or less difficulty, according to the difference in the structure, the greater or less debility of the part, and also according to the particular constitution of the individual; for we see people who are exposed to every danger of infection, without ever having the disease even during their whole life. Perhaps also the more or less violence of the action of the virus depends sometimes on the greater or less degree of acrimony of the virus itself.

*Traité de Maladies Vénériens par Swediaur.

The seat of gonorrhœa, when it immediately proceeds from impure coition, is always at a small distance from the orifice of the urethra, under the frenum, at that part of the canal where we observe a dilatation, called *fossa navicularis*. All gonorrhœas which are situated more anteriorly on the curvature of the penis, in the *veru montanum*, the neck of the bladder, or in the bladder itself, arise from bad treatment, or from some cause which has stopped or suppressed the primary discharge.

Sometimes by the natural progress of the disease, and more frequently from faults committed by the patient, or by the effects of improper remedies, the inflammation and irritation are apt to change their place. They often occupy the orifice of a mucous gland which opens at the first turn of the penis. At other times they affect the two glands of Cowper. Sometimes they occupy the protuberances which cover the orifices of the seminal vesicles; and they also sometimes takes place in the prostate gland, or in the neck of the bladder.

In some rare cases the contagious virus does not penetrate during the inflammation into the urethra, but applied to the extremity of the penis, it fixes itself upon the corona of the glans, and irritating the excretory ducts of the sebaceous glands there, produces a discharge which has been called the *gonorrhœa of the glans*.

When the urethra of a person who has laboured under gonorrhœa is laid open, no ulcer is almost ever found upon the surface of the internal membrane; and in those who have suffered much in consequence of the disease, there is merely a thickening and contraction of one or more

parts

Gonorrhœa.

parts of the urethra. Sometimes, though very rarely, excrescences are formed within it. The ducts of the mucous glands are obliterated, and the prostate gland and bladder changed in their structure.

It has been a matter of great dispute among those who have written on the venereal disease, whether the gonorrhœal and venereal virus are the same. In this controversy a number of very futile arguments have been brought forward. It is a striking fact, however, which the practical man must have always in view, that the venereal disease is never cured without mercury; whilst a gonorrhœa, however virulent, never requires that remedy. This difference in the treatment of the diseases some authors have attempted to explain, from the difference in the structure of the parts affected. It is remarkable, however, that the matter from the gonorrhœa never affects the skin, producing chancre; but that when its virus is applied to the vagina, or to the urethra of another person, gonorrhœa is the consequence. When it affects the prepuce too, it produces, in place of chancre, a morbid discharge from the sebaceous glands of that organ. It is also a striking fact, in the history of gonorrhœa, that however long it may remain, it never produces any constitutional affection. All these circumstances in the history of the disease, in its progress and symptoms, and in its cure, being so dissimilar to those of the venereal disease, are surely sufficient grounds to consider gonorrhœa and syphilis as two distinct morbid affections, and different from one another as much as any two diseases of the animal economy.

56 Specific nature of the virus.

57 *Treatment.*—All the forms of the venereal disease, when they are left to themselves, undermine and destroy the constitution; but gonorrhœa ceases without the resources of art, particularly if during its course the patient live a sober and regular life. The irritability of the urethra, the constitution of the patient, the faults in his diet, and his exercise and choice of remedies, and perhaps also the nature of the virus itself, which is more or less acrid, and of which the action will be more or less violent, often renders gonorrhœa a very severe disease. Experience confirms, that the sooner proper remedies are applied, and the sooner the patient is cured, the less he suffers; and the more certainly he avoids the disagreeable accidents which are so often the consequence of that disease. From this consideration, it is evidently of importance, either to prevent the disease entirely, or destroy it in its beginning. Two means have been proposed to accomplish these ends; one is, to remove the virus before it can act on the parts exposed to it; the other destroys and alters its nature, and prevents these effects from the moment that it gives the first signs of its action.

Different practitioners have tried and recommended various prophylactic remedies. Some have applied mercurial ointment upon the surface of the glans and prepuce, immediately after coition, and others different kinds of lotions and injections, as caustic alkali, lime water, alcohol diluted with water: these preparations being injected seven or eight times a-day, for several days after the commencement of the discharge.

By the use of injections the irritation is diminished, and the progress of the inflammation stopped; and when the discharge becomes thicker during their use, they ought to be continued eight or ten days after it has disappeared; for if we were to give up too soon the use of these injections, the inflammation and discharge would increase. In this case it is necessary to make the injection stronger, and to use it more frequently. The advantages to be derived from this practice do not seem, however, to be altogether confirmed; and it is to be wished, that enlightened and prudent practitioners would make some decisive experiments to determine whether injections are useful or hurtful in the commencement of gonorrhœa.

When inflammation has taken place, and when the discharge and other symptoms of gonorrhœa are completely formed, a different mode of treatment ought to be pursued. Repose, abstinence from all kinds of irritating food, spiceries, wine, &c. will contribute much to allay the irritation.

In order to defend the irritable parts against the acrid matter, and to moderate the symptoms of inflammation, authors have recommended the use of mucilaginous, oily, and sedative applications. That which renders the urethra in man so violently affected by gonorrhœa, and so different from catarrh, is not from the difference of structure in the organ, which has been supposed to be more irritable than the mucous membrane of the nose and other parts of the body. It is the salts of the urine passing along the urethra, which keeps up the irritation produced by the virus. It has been proposed, in order to remedy this source of irritation, to give gum arabic or the infusion of linseed internally; but these, when taken in the necessary quantities, generally injure the stomach. An infusion of hemp has been found by Swediaur to answer all the purposes, and not to be subject to the inconveniencies of the others. This remedy may be rendered more agreeable to take, by adding a little sugar to it; and in some cases a weak decoction of sarsaparilla may be advantageously added. All these drinks should be taken cold, or at least nearly milk-warm, and in small doses frequently repeated.

The antiphlogistic regimen must also be pursued in the treatment of gonorrhœa. The patient ought to avoid all exercise, or high-seasoned food. Lint, wet with a saturnine solution, should be kept constantly applied to the penis; and the patient should keep his bowels open with saline purgatives. When the symptoms of inflammation are considerable, and the pulse hard and frequent, bleeding becomes necessary, either general or topical: the constant application of fomentations and emollient poultices is also useful. Swediaur has advised, that camphor and the nitrate of potash should be given internally, and this should be continued according to its effects. Camphor alone, taken in the form of emulsion with sugar or fresh egg, is an efficacious remedy in allaying the pain and *ardor urinæ*. The use of camphor has also been recommended externally, with a view to allay the cordee.

These remedies ought to be continued as long as the pain and symptoms of inflammation in the urethra continue. After they are abated, the patient may be allowed a better diet, in order to prevent the urethra from being affected with a chronic gonorrhœa or gleet. Injections made of the extract of opium with acetate of lead, applied frequently from the commencement of the disease, contribute much to shorten it, and allay the accompanying pain. Sometimes, however, even the most mild injections do harm, from a particular irritable state of the

Gonorrhœa.

urethra. Great advantage has also been obtained by some, in very aggravated cases of the disease, by frictions of mercurial ointment on the perinæum, and along the course of the urethra, or by mercurial fumigations applied to the genital organs, and even by the injection of mercurial ointment into the urethra.

On the other hand, when the symptoms of erysipelatous inflammation prevail; when the patient is feeble, and of an irritable temperament; when he feels better after dinner; when the discharge is clear and profuse, accompanied with sharp pain, often lancinating throughout the whole urethra; and if the pulse is feeble and frequent, it is more adviseable to give him a less rigid diet; to allow him the moderate use of wine, and in some cases to give him opium and bark internally. We are sometimes surprised at the sudden changes which these remedies in such cases produce. The use of opium also contributes much to prevent cordee; and in all cases this ought to be avoided as much as possible, by fixing the penis downwards, and in making the patient lie on his side upon a mattress, which answers better than lying upon the back, and in a feather bed.

If in consequence of the violence of the inflammation the discharge stops, and the posterior parts of the urethra begin to be affected, we should have recourse to the warm bath, or apply vapours to the part, by placing the patient upon a vessel containing boiling water, and this should be repeated three or four times a-day; the patient should keep his bed, and an emollient cataplasm applied upon the penis, which should be renewed every hour. All kinds of injections in such cases are hurtful. The same treatment is also applicable when the discharge is stopped by the use of acrid and astringent injections, or by injections improperly used, or by the improper use of turpentine and balsams.

When the prostate glands and the neck of the bladder are affected, and the patient of a plethoric habit, it becomes necessary to bleed profusely, either at the arm, or by applying a number of leeches to the perinæum. In all these cases, a sedative clyster repeated every seven or eight hours, and a general or local warm bath used twice a-day, are the best remedies which can be used. Sometimes a blister applied to the perinæum is also useful.

The swelling of the lymphatic glands of the groin which sometimes takes place, is purely sympathetic, and disappears along with the inflammatory symptoms of the urethra.

In all cases of gonorrhœa the patient should wear a suspensory bandage whilst the disease continues *. It is also useful to persons who are obliged to take exercise, to wear a convenient bandage round the penis, which may be united to the suspensory in such a manner, that the penis may be enclosed in a kind of case, and thus defended from external injuries, from cold, and from friction; this bandage being kept constantly clean, by often changing the caddis, which is placed in its cavity. For this purpose, a hole should be left in the bag, covered by the caddis, which the patient can take away each time he makes water. Another general precaution which it is useful to make, is never to keep the penis bound up high, but to keep it low, in order that the matter may flow out freely, and may not pass backwards along the urethra.

* Plate DXIV. fig. 12.

The gonorrhœa which takes place in the glans and prepuce is generally easily cured, by injecting frequently warm milk between the glans and prepuce, and by keeping the penis in an emollient poultice. In those cases where the prepuce is so swelled that it cannot be pulled back, we ought to have recourse to sedative injections.

It is a useful general rule, which ought to be observed in all cases of gonorrhœa, to touch the parts affected as little and as seldom as possible; and every time that it is touched, to wash the hands immediately afterwards, and with the greatest care, fearing that, by carrying them unintentionally upon the eyes, nose, &c. these organs might be inoculated with the disease.

58 In women.

Gonorrhœa in women is seldom followed by so violent symptoms, or by so severe and dangerous consequences as in men. In some cases the symptoms are so slight, that they conceive the discharge, particularly at its commencement, to be nothing but the whites, to which disease a great many are subject, especially in the large towns of Europe.

The gonorrhœa in women has been supposed by many authors to have its seat in the cavities of the urethra. This, however, will not be found to be the case. The disease is seated, either upon the clitoris, or on the orifice of the urethra; upon the nymphæ, or in the cavity of the vagina; or even upon the inferior commissure.

59 Treatment.

With regard to the treatment, we have the same indications to fulfil in gonorrhœa in women as in men, with this difference, that one can see the change of structure in these parts, and thus, from the seat of the disease, employ proper injections and lotions from the beginning.

Precautions in using Injections.—The syringe used in men for this purpose ought to have a short point of a conical form and of a thickness proportioned, that not more than its extremity may pass into the orifice of the urethra *. The body of the syringe should be perfectly cylindrical, and the piston ought to play very accurately; for if the piston does not fit the body of the syringe, the injection, instead of passing into the urethra, regurgitates between the piston and the syringe. From the unsteadiness of the motion of the piston, the point of the syringe is apt to move suddenly on the urethra, and injure its thin and delicate membrane. To prevent any injury of this kind, we have employed with great advantage, particularly if the mouth of the syringe is made of metal, a small strip of caddis wrapped in a spiral manner round the mouth of the syringe, so as nearly to expose its point. If the disease is seated near the point of the urethra, the patient should be attentive to compress with one hand the urethra above the arch of the pubis, where the scrotum commences, whilst with the other hand he holds and guides the syringe. The liquid should be thrown in gently, and so as slightly to distend the urethra; the liquid is to be kept for a minute or two, and the same operation repeated two or three times in succession.

* Plate DXIV. fig. 12.

The liquid employed should always be used warm, which may be easily done by filling a cup with the necessary quantity, and placing the cup in a bason of boiling water.

It often happens, particularly in young people, that after

Gleet.

after having uſed injections ſome time with advantage, they become leſs attentive in uſing them, and neglect them even for a day. This omiſſion is always followed with bad conſequences, the diſcharge returning with double force; and the patient is obliged to continue the injections during ſome weeks more than would have been neceſſary, if the uſe of the remedy had not been interrupted.

In order, therefore, to prevent the danger of a relapſe, it is always prudent to adviſe patients to inject three, four, or even ſix times a-day, if the circumſtances demand it, and to continue the ſame two or three times a-day regularly for at leaſt ten or fifteen days after the diſcharge has entirely ceaſed.

For women the canula ought to be larger and longer. A canula of ivory, an inch in diameter, and two or three inches in length, fixed to a bottle of elaſtic gum, is the moſt convenient form of a ſyringe *.

* Plate DXIV. fig. 13.

60

Of Gleet.

It very often happens, that after the ſpecific inflammation of the urethra is removed, from which gonorrhœa is ſuppoſed to originate, a diſcharge ſtill continues. This diſcharge is not attended with pain, nor can it be communicated from one perſon to another. The matter which eſcapes is generally of a tenacious conſiſtence, and of a yellow colour, appearing to be compoſed of globules, mixed with a mucous fluid. When a cure cannot be performed, either by the uſe of injections, or by bougies, it has ſometimes been propoſed to inject liquids capable of exciting irritation and inflammation in the affected part of the urethra. It is probably from this principle that ſome gleets have been cured by violent exerciſe on horſeback, or a long journey. There have alſo been examples of ſimilar caſes cured by coition; but this is a cure not to be recommended, as there always may be a riſk of communicating the diſeaſe to the women. A bliſter, applied externally to the part affected, or to the perinæum, has alſo been found uſeful. The cold bath has often been recommended in obſtinate gleets, from which good effects often reſult; but there are other caſes in which it ſeems to increaſe the diſcharge.

It is alſo proper to change the injection; for it is obſerved that an injection leſs ſtrong ſometimes produces a good effect, after a ſtrong one has been employed without ſucceſs, and *vice verſa*. In many caſes it is uſeful to combine the uſe of internal medicines with external means. The chief of theſe are mercurial preparations, balſamic and reſinous ſubſtances, and tonics. Swediaur has uſed, with much ſucceſs, in gleets, pills made of turpentine and oxide of mercury. Among the reſinous ſubſtances which are employed, the moſt common is the balſam of copaiba. The beſt way of taking this remedy is to give the patient thirty or forty drops in a ſmall glaſs of cold water morning and evening, or from fifty to eighty drops for one doſe in the middle of the day, and afterwards to take, in a ſmall glaſs of water, twenty drops of the elixir of vitriol, which renders the balſam leſs diſagreeable to the ſtomach. Half a dram of turpentine, of the balſam of Tolu, or of the balſam of Canada, anſwers the ſame end. Swediaur mentions the caſe of a young man, who, having been for a long time diſtreſſed with a very obſtinate gleet, ſwallowed at once between two and three ounces of the balſam of copaiba, and was cured.

Coryza.

Sometimes the balſams, combined with tincture of guaiac, or with kino, produce a deſireable effect.

Among the corroborant or tonic remedies, the kino, which we have already mentioned, is one of the moſt uſeful; the cinchona alſo in powder or infuſion in red wine, or, which is ſtill better, in lime water; tormentilla in powder, or in extract, in the form of pills, joined, according to circumſtances, with preparations of iron, Glauber's ſalts, are uſeful and efficacious remedies. The tincture of cantharides, given in a doſe from twenty to thirty drops, has often been found a moſt uſeful remedy. It is one, however, which ought to be given with precaution, as it might do much harm to people of a delicate and irritable temperament.

There are, however, caſes, where all our efforts to cure a gleet are fruitleſs; and we ſometimes ſee, that nature alone can in time ſucceed, after we have uſeleſsly tried all the reſources of art.

There ſometimes remains a ſpecies of cordee or curvature of the penis after all the other ſymptoms of gonorrhœa have diſappeared. Frictions, with mercurial ointment, with camphorated oil, ſpirituous lotions, or electricity applied to the part, are moſt appropriate remedies in ſuch caſes.

In all caſes of obſtinate gleet, which are ſituated far back in the canal of the urethra, the ſtate of the proſtate gland ſhould be carefully examined; for they often ariſe from a diſeaſe in that part. When the proſtate is found ſwelled and hard, Swediaur has ſeen inſtances where, after a mercurial treatment, the repeated application of cupping-glaſſes to the perinæum, and the uſe of large doſes of the *conium maculatum*, has ſucceeded, other remedies having failed.

The gonorrhœa of the proſtate is a morbid diſcharge of mucus from that gland, mixed ſometimes with the liquor of the ſeminal veſicles; and it takes place principally through the day, without any venereal deſire. This diſeaſe is ſoon followed by feebleneſs and general debility, with emaciation of the whole body, and even with death; particularly if the patient has not employed proper remedies.

The remedies moſt efficacious are the cold bath, injections of metallic ſalts, fomentations of hemlock, bliſters to the perinæum, and internally tonic medicines, with a well-regulated diet.

61 Coryza.

SECT. II. *Of Inflammation of the Mucous Membrane of the Noſe.*

Inflammation of the mucous membrane of the noſe is generally preceded by dryneſs in the noſtrils, with an itching feeling, and with a weight over the forehead. It is alſo accompanied with ſneezing and an increaſed flow of tears. The ſecretion of mucus from the noſe is at firſt diminiſhed, and afterwards becomes very abundant. At firſt it is limpid and irritates the ſound ſkin of the upper lip, over which it paſſes, and becomes afterwards opaque, of a yellowiſh white colour, and a diſagreeable odour. This ſtate is ſometimes accompanied by fever, and it continues for a longer or ſhorter period. Moſt commonly it ceaſes at the end of a few days. It ſometimes, however, becomes chronic and indetermined, in which caſe it is often intermittent, and re-appears at regular

Otitis.

regular periods. Coryza, like all other inflammations of the mucous membranes, terminates by resolution. It sometimes passes into the state of chronic catarrh, and it also occasions an ulceration of the mucous membrane of the nose; but this is extremely rare.

Coryza is frequently accompanied with inflammation of the mucous membrane of the eye, it also spreads in many instances along the eustachian tube, producing deafness, and it is very apt also to pass down the trachea and affect the lungs.

The nose is sometimes affected with a discharge of thick viscid mucous, when there is very little apparent redness or pain. Such instances are often connected with the formation of polypi: but we have observed several cases, where no other symptom than the mucous discharge appeared, and where the disease had very much the general character of some discharges from the urethra.

62 *Treatment.*—Coryza is commonly an affection so slight, and of such short duration, that it is seldom necessary to employ any means to produce an abatement of its symptoms. Sometimes, however, the symptoms go to a very high degree, and it is then that emollient vapours directed into the nasal cavities are particularly indicated. If much symptomatic fever accompanies the disease, it may be adviseable to draw some blood from the arm, and in all cases a brisk purgative will be found to relieve the fullness and uneasiness in the head. When the inflammation spreads along the mucous membrane of the trachea, it becomes the more necessary to use every means to alleviate the inflammatory symptoms, and to prevent the inflammation affecting the mucous membrane of the bronchi.

Patients labouring under this disease, feel remarkable relief from living in a warm atmosphere; and the symptoms of inflammation of the nose and trachea will be much alleviated by the internal exhibition of opium.

When the inflammation and the discharge are of a chronic nature, astringent injections, or a doffel dipt in similar solutions, kept in the nose during the night, are in such cases the most useful applications. They gradually diminish the quantity of the discharge, and render it more thick and tenacious; and the sense of smelling, which is commonly destroyed, is gradually restored.

If the discharge be fœtid, and occasionally mixed with blood, in all probability it originates from the formation of an abscess or ulcer, connected with a carious bone.

63 SECT. III. *Of the Inflammation of the Mucous Membrane of the Ear* (Otitis).

In inflammation of the ear, there is the same characters deduced from analogy of structure, as in other mucous membranes. The principal causes of this disease are sudden changes in the atmosphere; above all, the change from heat to cold, or from dryness to moisture; coldness of the nights, north winds, suppression of any regular discharge, the crisis of acute diseases, metastasis, the presence of an irritating body in the ear, or the imprudent application of oily or spirituous substances.

The inflammation sometimes takes place in the *meatus auditorius;* and in other cases it is confined to the cavity of the tympanum and eustachian tube. In the first case, there is more or less pain, and buzzing in the ears, and afterwards a discharge of thin reddish yellow matter. This matter gradually becomes white and opaque, and increases in consistence till the termination of the disease; when it differs in nothing from the wax of the ear, but in its white colour. This affection generally lasts twelve or fifteen days. It sometimes spreads to the external parts of the ear, and often passes into a chronic state.

When the inflammation is confined to the cavity of the tympanum, it produces an obscure tingling sensation, and a feeling of tension, which the patient supports without much inconvenience; but most frequently the inflammation is propagated from the cavity of the tympanum along the eustachian tube. In this case, the pains become more violent and extend along the contiguous mucous surfaces; they pass from the interior of the ear into the throat; there is great difficulty in swallowing, and the food, when passing through the pharynx, gives a sensation as if the skin had been eroded. The motions of the neck also become uneasy, and the smallest attempt to cough, to sneeze, or blow the nose, produces a painful sensation in the ear. The patient also complains of a stoppage in the nose, of a frequent dry cough, and of pain in the head, and more or less fever in the evening. The ear also feels hard and distended, and there is generally deafness, particularly towards the end of the disease. Soon all these symptoms diminish except the hardness in the ear, which augments continually till the fifteenth or twentieth day.

Most commonly after this period, a quantity of fœtid matter is suddenly discharged into the external ear, or into the throat, and then all the symptoms disappear. This discharge generally diminishes daily, and in a short time ceases altogether. At other times, particularly in young people, it continues, and becomes chronic.

Treatment.—When the inflammation is confined to the external meatus, the disease is generally so slight that it may be allowed to run though its common periods, and it is merely necessary to keep the patient warm. When the inflammation is very considerable, the mildest injections give pain, and in place of moderating the symptoms, they increase the irritation. We ought therefore to do nothing, except, perhaps, to allow some warm vapour to pass into the ear, and to pursue the antiphlogistic regimen. About the twelfth or fifteenth day, it may be useful to apply tonic medicines, such as aromatic alcohol dipped in a piece of cotton. When the inflammation is in the tympanum, or the eustachian tube, besides emollients, it will be also necessary to give some brisk purgative, or to employ local or general blood-letting. If the membrane of the drum is much distended, and accompanied with violent pains, it has been even proposed to make an opening through the tympanum*. When the matter has been discharged from the tympanum either spontaneously or artificially, little more is required to be done, unless the disease assumes a chronic form. This is more frequent in children. We often see the purulent discharge continue in them for many months, and some of the small bones of the ear become carious, and are discharged along with the matter. In such cases small doses of calomel, for some time repeated, blisters applied behind the ear, and injections of lime water

64

* *Nosographie Philosophique par Pinel.*

Angina.

water combined with muriate of mercury, acetate of lead and the like, ſhould be employed.

65 SECT. IV. *Of Angina.*

The parietes of the mouth, trachea, and larynx, are often inflamed in catarrhal affections, and preſent ſymptoms which vary according to the intenſity of the diſeaſe, and particular ſeat of the affected membrane.

Angina has therefore been diſtinguiſhed according to its ſeat in the tonſils, the trachea, the pharynx, and larynx.

When the patient has great difficulty in ſwallowing his food, and when the pain ſtretches in chewing, to the ear along the euſtachian tube, by a ſort of crepitation, and if, on inſpection of the throat, the amygdalæ and edge of the palate appear much inflamed, along with an abundant excretion of mucus, the angina has its ſeat principally in the amygdalæ.

Angina affects the pharynx when deglutition is difficult or impoſſible, and the food is returned by the noſe, reſpiration at the ſame time not being impeded. This inflammation is alſo viſible by examining the bottom of the mouth.

But if the deglutition is difficult; if no redneſs is to perceived at the bottom of the throat, and if the patient has great difficulty in reſpiring, a ſharp pain in the motions of the larynx, the voice acute but weak, and the ſpeech ſhort, we may then conclude that the inflammation has attacked the larynx, or upper part of the wind-pipe. An affection of this kind, though a few caſes have been known to take place in adults, generally attacks children under twelve years of age. It is known by the name of *croup*.

When the inflammation affects the amygdalæ, inhaling ſteams of warm water and vinegar will often be found to give great relief. A poultice, too, applied to the outſide of the throat, aſſiſts in leſſening the tenſion of the inflamed parts. Though in many caſes the inflammation ſeems to be confined to the mucous covering of the glands, yet in others it ſpreads into the glandular ſubſtance, where it generally advances to ſuppuration and abſceſs. In ſuch caſes, the early diſcharge of the matter gives great and immediate relief; and though no matter has been formed, puncturing the inflamed part with a ſharp inſtrument often produces an alleviation of all the ſymptoms. The inſtrument delineated in Plate DXIV. fig. 14. is well calculated for theſe purpoſes. By altering the poſition of the ſcrew in the handle, the depth of the cutting part of the inſtrument may be regulated. When it is to be uſed, the fore finger of the left hand is to be introduced down the mouth, and the perforator concealed in the canula introduced as a director. When the extremity of the canula reaches the inflamed part, the perforator may be then ſafely puſhed into it, of a ſufficient depth, which had been previouſly regulated.

When the inflammation affects the pharynx, relief will alſo be obtained by inhaling the ſteam of warm water, and by employing antiphlogiſtic remedies. In croup, calomel has been found to have a ſpecific effect; and it is aſtoniſhing the quantity that has been given to infants for the cure of that diſeaſe. See MEDICINE.

When the effuſion which takes place in croup, is chiefly confined to the upper part of the larynx, and produces ſymptoms of ſuffocation, it has been propoſed to make an artificial opening into the trachea below where the matter is effuſed, in order to ſave the life of the patient. See BRONCHOTOMY.

Of the Catarrh of the Bladder.

SECT. V. *Of the Catarrh of the Bladder.* 66

The ureters, the bladder, and the urethra, are all liable to be affected with catarrhal affections from general cauſes, the ſame as thoſe affections of the mucous membranes which have been already mentioned; and beſides, the ſurfaces of the mucous membranes of theſe parts are expoſed to the action of particular cauſes, namely, the ureters and the bladder to calculi, and the urethra to the venereal virus.

The catarrh of the bladder is more frequent among men than among women; and old people are more ſubject to it, than thoſe at any other period of life. It is often produced by the internal uſe of cantharides, by acrid diuretics, and by the progreſs of hæmorrhagy from the urethra. The ſudden expoſure to cold, ſuppreſſed perſpiration, the diſappearance of different diſeaſes of the ſkin, of rheumatiſm, and of gout, are followed almoſt ſuddenly by this catarrh. Other circumſtances may alſo give riſe to the chronic catarrh of the bladder. The preſence of a calculus or any foreign body, the continual application of bougies, a ſwelling of the proſtate gland; and above all, ſtrictures of the urethra.

This diſeaſe is marked by pains of the bladder, and at the point of the urethra, both before, and whilſt making water. The injection of the urethra is more or leſs difficult, according to the action of the bladder, and of the freedom of the paſſage of the urethra. The hypograſtric region is tenſe, and the urine preſents variety of colours; it is ſometimes whitiſh, or reddiſh, or of a deep yellow colour; it is muddy, and it exhales an odour of ammonia, which becomes more ſenſible a ſhort time after it has cooled. It alſo forms, in moſt common caſes, a mucus, which mixes and comes away with the urine in the form of glary filaments, and which is afterwards depoſited at the bottom of the veſſel, in the form of the tenacious glary ſubſtance, reſembling ſomewhat the white of egg.

The chronic inflammation of the mucous membrane of the bladder, may be accompanied with an ulceration of the kidneys or bladder; the mucus diſcharged then becomes of a greeniſh yellow colour, ſometimes mixed with ſtreaks of blood. It is depoſited ſlowly, is mixed eaſily among the urine, and in water; it has little viſcidity, or fœtor, and does not coagulate by ebullition. The other ſymptoms which accompany this excretion, as fever, pain, waſting of the fleſh, ſufficiently diſtinguiſh this double affection of the bladder. The chronic catarrh is ſubject to return with intolerant pain in the region of the pubis and perinæum, accompanied with reſtleſſneſs and anxiety. Theſe intermiſſions are irregular, and may remain ſome weeks.

Treatment.—The matter which exiſts in the mucous membrane of the bladder, and that of other membranes of the ſame name, is ſufficient to point out the means which are to be employed in its treatment. The warm bath, and mucilaginous drinks, are particularly indicated at the beginning of the acute catarrh; but the tendency which it has to become chronic, ought to make us cautious 67

Strictures.

tious in not profecuting debilitating remedies too far. Opium fhould be employed with great prudence, notwithftanding the intenfity of the pain; and as this is often the refult of the diftenfion of the bladder, from the accumulation of urine, it is fometimes neceffary to have recourfe to the introduction of the catheter.

The chronic catarrh of the bladder is generally difficult to cure, and the more fo, if it occur in old age: if it arifes from the preffure of a ftone in the bladder, there is no cure but the operation of lithotomy; if it arifes from metaftafis, rheumatifm, or any other difeafe, we ought to employ remedies to the fkin and inteftinal canal, and pour tonic injections into the bladder. The uva urfi has alfo been found a ufeful remedy. Exercife, dwelling in dry and elevated places, the ufe of woollen clothes next the fkin, contribute often more to the cure of this difeafe, than the ufe of medicines, and they ought always to be combined.

The conjunctiva covering the eye-ball, eye-lids, and lacrymal paffages, are alfo fubject to inflammation; but thefe will be treated of among the difeafes of the eye and its appendages.

68 SECT. V. *General Remarks on Strictures.*

The term ftricture has been ufually applied to a contraction of the urethra; generally arifing from a thickening of the mucous membrane lining that canal. This change of ftructure is not, however, confined to the mucous membrane which lines the urethra; the fame morbid alteration takes place in the œfophagus, in the euftachian tube and meatus externus, in the maxillary finus, in the bladder, in the lacrymal paffages, and in all canals lined by mucous membranes. Strictures, however, occur much more frequently in the urethra, and are there more pernicious than in any other part. They appear alfo fometimes in the upper part of the œfophagus. A fimilar change has been obferved in the internal part of the bladder. Bichat found the membrane lining the maxillary finus feveral lines in thicknefs, and alfo the canals of the tympanum much thickened *; and reafoning from analogy, and from what we may obferve by an attentive examination of the fymptoms of many cafes, of what is ufually called fiftula lacrymalis, there is little doubt but a contraction and thickening often take place of the mucous membrane lining the lacrymal fac and duct, and produce that difeafe.

* *Anatomie Generale*, tom. iv., p. 431.

This change in the ftructure of mucous membranes is always the confequence of inflammation; and when the membrane is thus altered, the difcharge, inftead of being healthy mucus, is generally a puriform fluid, apparently a mixture of pure mucus and globules of pus.

69 SECT. VI. *Of Strictures in the Urethra.*

The treatment of the difeafes of the bladder and urethra has always been confidered a difficult branch of furgery, as their true nature is often obfcure, and as it is by no means eafy to direct the proper means of relief.

Of the great variety of caufes which difturb the functions of thefe organs, ftrictures in the urethra are perhaps the moft frequent, and moft ferious. They prevent the free evacuation of the bladder; greatly difturb, if not entirely deftroy the function of generation; and often give origin to conftitutional fymptoms which fometimes increafe to an alarming degree, and even prove fatal.

Strictures of the Urethra.

That the urethra fhould be fubject to many morbid changes, we may infer, not only from our knowledge of the functions it performs, but alfo from its delicate and no lefs complicated ftructure.

One part of this ftructure is intended for the evacuation of the urinary bladner, the other for the tranfmiffion of the feminal fluid; and as in the exercife of this laft function, the urethra fympathifes, in a greater or lefs degree, with the whole fyftem, and alfo with the mind itfelf, it muft have a connection with many of the other organs of the body.

Accordingly, we find that patients who have obftructions in the urinary canal, have at the fame time other complaints, which get well when the obftruction is removed. And, on the other hand, difeafes of other parts bring on morbid affections of the urethra, which are cured along with the original complaint.

The whole extent of the urinary canal is lined by a delicate membrane, which is conftantly covered with a vifcid fluid, fecreted by numerous glands, whofe ducts open on its internal furface by orifices which are called lacunæ.

It is highly vafcular, and is endowed with fo much nervous fenfibility, that irritating bodies applied to it often affect, or even derange the whole fyftem.

It has a confiderable degree of contractility, is evidently elaftic, and perhaps may poffefs a mufcular power, although no mufcular coat has yet been demonftrated; but to whatever caufe this contractility be owing, it is well known it does not contract upon irritation.

As a proof of this contractile power, a remarkable cafe is mentioned by Mr Cline in his lectures, where a ftone was lying in the membranous part of the urethra one evening, which during fleep had been expelled and was found among the bed clothes the following morning.

The contraction which forms a ftricture in the urethra may take place round the whole circumference of the canal; it may arife chiefly at a particular point of the circumference; or, it may extend along a confiderable extent of its furface, and thus produce obftructions of different forms.

The ftricture once begun, continues no longer than the caufe which firft produced it continues to operate. But if the parts are kept long in this ftate of contraction they generally are attended with a degree of inflammation; the membrane of the urethra acquires a morbid degree of thicknefs; the furrounding parts are altered in ftructure; and this change of form and appearance remains after the caufe which originally produced them has ceafed to operate.

That fpafmodic ftrictures do exift appears from the impreffions made on bougies which have been paffed through them, and from the examination of the parts after death; for although complete obftructions to the bougie were found when alive, yet not the fmalleft remains can be obferved on diffection. This contraction is peculiarly violent, and from what we have feen more frequent, at the foffa navicularis than at any other part of the canal.

A gentleman, after many attempts to make water during the night, was not able to pafs a drop, and he applied for relief in the morning. A bougie was introduced, and met with a complete obftruction at the glans, which

Strictures.

which yielded in a few ſeconds after the bougie was in cloſe contact with it; on being withdrawn the urine flowed freely, and the complaint has never ſince returned.

Contractions at this place are ſometimes ſo violent as for a long time to interrupt the entrance of the bougie; and in one caſe it was ſo ſtrong as nearly to cut the inſtrument through, after it was introduced. What is remarkable, this happened repeatedly with the ſame patient.

70 Appearances on diſſection.

When there has been a permanent ſtricture, the natural ſtructure of the urethra is changed, and the morbid alterations it has undergone may be ſeen on diſſection. There is commonly a contraction at one particular part of the canal; and the appearance of it has been compared to that which would have been given had a packthread been tied round it, or in ſlight caſes it is a mere narrowing *.

* See Plate DXIV. fig. 6. and 7.

When a ridge is formed projecting into the cavity of the canal, it is found to be a doubling of the inner membrane, with the cellular ſubſtance lying between the fold. The internal membrane itſelf is diſeaſed; it aſſumes a whitiſh colour; becomes much harder, ſometimes as hard as cartilage; and in ſome caſes this change is confined to the doubling of the ſtricture itſelf, whilſt in others it extends into the cavernous bodies. Theſe ridges or folds often form over one another, ſo that the intermediate portion of urethra becomes preternaturally contracted alſo; but it never becomes ſo narrow as at thoſe parts where the original ſtrictures were formed. Inſtead of a diſtinct curtain or fold, it happens alſo in ſome caſes that the urethra has the appearance of a cone gradually converging before the ſtricture, and diverging in the ſame manner behind it.

The contraction is generally round the whole of the circumference of the urethra; but it ſometimes happens that it is only at one ſide, and in ſuch caſes the urethra does not form a uniform tube, but it becomes ſerpentine and contorted in various directions.

When one ſtricture is formed, that portion of the urethra anterior to it is liable to ſuffer ſome changes, and theſe probably ariſe from its not meeting with the ordinary diſtenſion, the ſtream of urine being diminiſhed. It is by no means uncommon, therefore, to find in thoſe caſes where the original ſtricture has been formed near the bladder, another ſtricture anterior to it, ſo that when an obſtruction is found at the glans or four inches and a half from it, another is generally met with at ſeven inches, or at the bulb.

71 Situations of ſtricture.

From the peculiarity in the form of the urethra, ſome parts are ſubject to ſtrictures much more frequently than others.

In the adult, and in the relaxed ſtate, the urinary canal is about nine inches long, and nearly of the ſame diameter as a common quill; but its ſize varies at three different points, and there ſtrictures moſt frequently ariſe. Theſe contractions are at the glans, the bulb, and the proſtate gland (ſee fig. 5. Plate DXIV.) The narroweſt part is juſt below the bulb, and here ſtrictures moſt frequently occur.

The natural contraction renders it, in almoſt every caſe of ſtricture, the ſeat of the diſeaſe. This part of the canal ſeems alſo to poſſeſs an uncommon degree of irritability, as it is here that the contraction takes place in caſes of ſtrangury. When ſtrictures continue long, and the violence of the ſymptoms increaſe, diſeaſes ariſe in other parts.

The urethra between the ſtricture and bladder, from the obſtruction the urine has to overcome, enlarges, and is ſometimes attacked by inflammation.

As in moſt caſes the ſtricture is attended with a gleet, the glands ſituated about the neck of the bladder become diſeaſed. The bladder becomes extremely thickened, and its capacity diminiſhed. From the ſtrong exertions it is neceſſary to make in order to overcome the obſtruction, and as it cannot contain much urine, the ureters alſo become dilated.

When the diſeaſe advances ſtill farther, ſo that it is impoſſible to evacuate the bladder, the obſtruction being complete, the urine eſcapes by ſome new channel; for as in ſuch caſes the parts between the bladder and obſtruction make leſs reſiſtance than its coats, both on account of their natural ſtructure, and as theſe parts are generally inflamed or ulcerated, they give way, and the urine takes a new courſe. When this change has once taken place, ſo that no urine paſſes through the meatus urinarius, the other ſymptoms will differ according as the aperture has been formed by ulceration of the inner membrane of the urethra, or by a ſudden rupture. For when the membranous part of the urethra has been eroded, a ſuppurating cavity muſt have formed in the contiguous cellular ſubſtance, and as the urine cannot ſo eaſily be diffuſed in the ſurrounding parts, it makes its way without difficulty through the integuments.

But when a ſudden rupture or ulceration of the inner membrane of the urethra takes place, as the urine meets with no obſtruction in inſinuating itſelf into the cellular membrane, it effuſes itſelf in a ſhort time over the perinæum, ſcrotum, and adjacent parts; extenſive abſceſſes are formed where the urine was diffuſed; and as theſe burſt in numerous places, fiſtulous openings are formed, which have either a direct or indirect communication with the bladder, and through which the urine continues to paſs till the original obſtruction is removed.

Symptoms.—Often this complaint does not become of ſuch importance as to give alarm to the patient till many months, or even years, after the original cauſe has been forgot. At other times, a few months after a gonorrhœa has been cured, the urine, inſtead of coming away with the accuſtomed eaſe, begins to be paſſed with ſome difficulty. The ſtream, in place of being full and even, diminiſhes and becomes unequal; ſometimes it comes in drops after much ſtraining and exertion, has a forked appearance, or ſcatters in all directions. From the irritable ſtate of the parts, the ſmalleſt quantity collected in the bladder, brings on a deſire to make water, and a continual uneaſineſs all along the courſe of the canal, about the perinæum, anus, and lower part of the abdomen. In moſt caſes there is a diſcharge of matter from the urethra. The gleet is always more ſevere after any debauch or venereal act. It comes on immediately after ſuch exceſs, and gradually diminiſhes or diſappears. It is alſo not unfrequent to find ſtrictures accompanied with that profuſe diſcharge of mucus from the bladder called *catarrhus veſicæ*. The irritation communicated to the bladder in conſequence of the diſeaſe of the urethra, brings on inflammation, which is followed by a profuſe diſcharge of mucus from the whole of its internal ſurface, and this mucus comes away with the urine, and 72

Strictures. is depoſited, and firmly adheres at the bottom of the pot in the form of a tough tenacious maſs.

Nocturnal emiſſions are ſometimes the only ſymptoms which lead us to ſuſpect the exiſtence of ſtricture; for in ſome caſes the diſeaſe is neither attended with any fixed pain in the urethra, nor is there any diſcharge of matter.

Fiſtulas in the perinæum, and along the courſe of the penis, often derive their origin from an obſtruction of the urinary canal.

When, either from irritating injections, bougies, or any other cauſe, inflammation comes on, the urethra is completely ſhut at the place of the ſtricture, and the internal membrane giving way, the urine is effuſed in the cellular membrane, which gives riſe to abſceſſes and fiſtulous openings, through which the urine continues to paſs, till the ſtricture is removed.

The inflammation in ſome caſes ſpreads to the ſurrounding parts; the mucous glands inflame, ſuppurate, and burſt; and hemorrhoidal tumors often form at the extremity of the rectum.

Beſides theſe, the more uſual ſymptoms of ſtricture, there are others which accompany that complaint, and ariſe from conſtitutional cauſes.

The moſt frequent of theſe is a febrile attack, in the form of a complete paroxyſm; but it differs from the common intermittent fever, in its ſhort continuance, its irregularity, and in the violence of its termination. It happens moſt frequently to thoſe who have been in warm climates; but it is by no means confined to them alone.

People of weak conſtitutions have often ſickneſs at ſtomach, nauſea, and vomiting, and ſometimes an uneaſy ſtate of irritability about the ſtomach, which gets better when the ſtricture is relieved.

Gout, epilepſy, hydrocele, ſciatica, eryſipelas, ſwellings in the perinæum, occaſional ſuppreſſions of urine, have all been found connected with ſtricture; but ſuch caſes rarely occur.

There are other diſeaſes of theſe organs which have ſo many ſymptoms in common with ſtricture, that it is neceſſary to inquire with much attention into the hiſtory and ſtate of all the ſymptoms, before we can judge of the true nature of the complaint; and when there is any reaſon to ſuſpect that an obſtruction exiſts, it is aſcertained only by the introduction of a bougie; but the mode of doing this will be explained when ſpeaking of that inſtrument.

73 Diagnoſis. There are diſeaſes that ought to be mentioned as being liable to be miſtaken for ſtricture, and always kept in view in forming the diagnoſis. An irritable ſtate of the urethra, proceeding from gonorrhœa, is one that is very frequent.

In ſuch a caſe there is a diſcharge of matter and a pain in making water. The urine flows in a ſmall ſtream at the commencement, but before it is all evacuated it is of the natural ſize. The ſymptoms come on a few hours after coition, but abate in a ſhort time, and whenever the irritating cauſe is repeated, they return.

The bladder alſo, when irritated, brings on diſeaſes of the urethra, as theſe parts ſympathize ſo ſtrongly with one another; but when the primary affection is in the bladder, there are always ſymptoms which aid us in diſcovering the true complaint.

Enlargements of the proſtate gland are by far the moſt apt to miſlead our judgement. Scrophulous and ſchirrous enlargements of that organ were at one time ſuppoſed to be very frequent cauſes of retention; it is now generally believed that they occur ſeldom, and are chiefly confined to people advanced in life. Strictures.

It will be afterwards mentioned how ſwellings of the valvular proceſs of the proſtate are apt to be miſtaken for ſtricture when a bougie or catheter is introduced. The obſtruction in ſuch a caſe is always at a diſtance, as the canal has increaſed in length from the enlargement of the parts.

If attention be paid to this remark, and if the gland be at the ſame time examined from the rectum, little doubt will remain of the nature of the diſeaſe.

It is often difficult to draw off the water when the proſtate gland has become thus diſeaſed: to do this, much benefit will be found in uſing a catheter longer than ordinary, as the common curve cannot reach the extremity of the urethra from the increaſed length of that canal. Pouches or irregularities are alſo apt to form from the unequal growth of the gland; and as the ducts of the ſeminal veſicles and mucous glands become enlarged, the inſtrument ought to be of a large diameter to avoid being entangled by them.

74 Cauſes of ſtricture. From the idea we have of the manner in which ſtrictures are formed, we infer that many ſubſtances of an irritating nature, whether applied immediately to the parts themſelves, or to thoſe connected with them, may, under particular circumſtances, produce this diſeaſe. The ſtone irritating the bladder, numerous diſeaſes of that organ and proſtate gland, irritations in conſequence of gonorrhœa, long and repeated erections or other ſtimulants, and the natural diſpoſition which the urethra has to contract in ſome conſtitutions, are the common cauſes of ſtricture. In whatever manner this irritation is produced, the ſymptoms and changes obſerved in the ſtructure of the urethra, make it probable that there is always a certain degree of inflammation ſubſequent to or accompanying it. Obſtructions in the urethra were ſuppoſed by Daran, and others about his time, to originate from cauſes very different from thoſe now mentioned. They conceived that the diſcharge from gonorrhœa proceeded from internal ulcers, and that the cicatrices and indurations they left behind were the moſt common cauſes of ſtricture. But ſince the nature of the diſcharge from gonorrhœa is found very rarely, if ever, to be purulent, and as ulcers occur very ſeldom, they cannot be conſidered as a common cauſe of the diſeaſe in queſtion.

Caruncles were alſo ſuppoſed to be frequent cauſes of obſtruction in the urethra; but theſe are rarely met with. One preparation of ſuch a caſe may be ſeen in the muſeum of St Thomas's Hoſpital. Drs Hunter and Baillie have ſeldom met with them. Indeed, ſince the internal membrane of the urethra ſo much reſembles that which lines the cavities of the noſe, mouth, and œſophagus, and as ulcers in theſe parts are more diſpoſed to form ſkin and heal, than to produce fungi, few caſes of obſtruction can be aſcribed to ſuch tumors.

The other cauſes which prevent the free diſcharge of the urine, are thoſe which are attended with no morbid change in the ſtructure of the urethra itſelf.

Such are tumors or indurations of the proſtate gland, of the veſiculæ ſeminales, or parts compoſing the body of

Strictures. of the penis, or of the mucous glands along the course of the canal.

By far the most common of these, is an obstruction into the entrance of the bladder, from a diseased prostate gland.

This proceeds from a new form which the canal has assumed in consequence of an enlargement of its parts.

Its cavity becomes deeper from the growth of its sides, and the posterior extremity or valvular process forms a projecting tumour into the cavity of the bladder, which interrupts the passage of the urine, or the entrance of a catheter.

From the frequency of this appearance in diseased prostate glands, it is probable that it is the cause of diseases of that organ being often mistaken and treated as strictures of the urethra, and has in numerous instances not only prevented the introduction of a bougie into the bladder, but has been the cause of the formation of artificial passages through the substance of the gland.

75 *Treatment of Stricture.*—From the erroneous ideas that the older surgeons formed of the nature of strictures, it was not to be expected that the means of cure they employed were either founded on just principles, or attended with much success.

They made use of various external and internal remedies; they prescribed long and tedious courses of mercury, and gave many medicines which were supposed to have peculiar virtues in curing diseases of these organs.

They sometimes introduced into the canal mechanical instruments in order to dilate it; and when that was impracticable, a new passage was made by force, or the diseased parts were dissected away, and a new canal formed in the sound parts.

76 Wiseman's practice. Wiseman, so far back as the beginning of the last century, exploded many of these rude and dangerous practices, and introduced into use the *waxed candle* or *bougie*, by means of which he said he "crushed the carunculi to pieces." He met with cases, however, where this could not be done; that is to say, cases where it was impracticable to pass small bougies into the bladder; and this led him to adopt another mode of treatment. He consumed them by stimulating applications in the following manner. The wax at one end of the candle was scraped away, and the wick dipped in plasters composed of alum, red precipitate, calcined vitriol, ærugo, and other such substances, and then it was applied to the caruncle.

77 The use of caustic proposed by him. "But (says he), if after doing this you cannot pass the caruncle, you may well conclude it callous; in which case you may pass a canula into the urethra to that caruncle, and whilst you hold that there steady, you may convey a grain of caustic into the canula, and press the caustic to it; and whilst you hold it there, you will perceive its operation by the pressing forward of the caustic. The caruncle thus consumed, cast in a lenient injection daily; and if you take notice of his urine, you may see the separation of the sloughs as rags in it. After which you may with the common medicated candles wear away the remainder, and with the injections cicatrize it."

After Wiseman, Daran introduced into use a kind of bougies, the particular composition of which was kept secret. They were supposed to possess very great medical virtues; and it was from these qualities that their superior efficacy was supposed to proceed. Other surgeons soon began to imitate them, and they found that those they made had the same qualities as those of the original inventor. This led them soon after this to alter their opinion of their mode of action; and, instead of supposing that all the beneficial effects proceeded from the medicines in their composition promoting suppuration, cicatrization, &c. they explained their action on the principle of a simple wedge.

But however successful their practice might have been in alleviating, if not in curing strictures, yet many cases occurred where the obstruction was so complete as altogether to prevent the bougie being introduced. They were therefore obliged to continue forcing past the obstruction, till the mode of treatment described by Wiseman was renewed, and held out as an original invention. The practice, indeed, generally followed by modern surgeons is founded entirely on what Wiseman has written; but since these have been better understood, from the progress of pathological investigation, it has been considerably modified and improved.

When we consider the effects of these modes of practice, and try to reconcile them with the ideas we have formed of the causes producing the stricture, it would appear that those very means employed for their removal belong to the same class of bodies as those originally producing the complaint.

As this cannot be denied, yet it will appear neither surprising nor improbable, when we reason from analogy, and observe the effect of similar applications to other diseased parts, and similar phenomena in other organs. It may be here observed, that the action of any part depends not only on the kind of the stimulus applied, but also on its degree of violence. We know that a slight pressure on the skin produces uneasiness or tickling, whilst to a stronger degree it passes unnoticed. A certain degree of light produces distinct vision, but a more intense one destroys it. The upper part of the throat is thrown into violent action by a slight irritation, but a more powerful one has no effect. Similar phenomena take place in disease; or slight irritations sometimes occasion violent morbid action, whilst those that are more powerful not only produce a lesser degree of disease, but are even employed to remove such as are brought on from a slighter cause. We see this opinion strongly confirmed in ulcers, attended with much local or constitutional irritation. The most emollient applications in such cases, if they do not increase the sufferings of the patient, bring no relief; whilst strong stimulating ones, such as a solution of lunar caustic, or diluted nitrous acid, seldom fail to diminish the pain and promote the cure of the disease *.

* See *Home's Observations on Strictures.*

In toothach, the irritation produced by the external air on the exposed nervous surface excites much pain and even symptomatic fever; but the application of caustic or acid destroys these sensations.

The same we will find to take place when we consider the nature and the mode of treating strictures of the urethra; and if we can prove that strictures have all that variety of character which an ulcer or many other diseases have, we will be better able to judge of the comparative merit of the different modes of treatment, and be able in some degree to account for their mode of action.

Strictures.

Of the Bougie.

78 When ſurgeons attributed all the beneficial effects of bougies to their mechanical qualities, the principal deſideratum was to have them ſufficiently pliable to take the curvature of the urethra, firm and elaſtic to make reſiſtance, and mild ſo as to produce no irritation. But however ſimple ſuch inſtruments might be in their compoſition, yet it will appear probable that their ultimate effect is not the ſame as that which a wedge produces on inanimate matter. That bougies cannot act by their mechanical powers in removing ſpaſmodic ſtricture, appears from thoſe caſes where the mere introduction of the inſtrument into the urethra, and its contact with the obſtruction, removes at once all ſpaſm.

The ſame thing is obſerved in thoſe caſes of permanent ſtricture which are attended with occaſional ſpaſm. In ſuch caſes it frequently happens that a bougie finds a complete obſtruction on its firſt introduction, but after being allowed to remain for ſome time in the canal it paſſes readily without force. A remarkable caſe of this kind happened, where there was not only a ſtricture in the urethra, but fiſtulous openings in the perinæum and ſcrotum, through which moſt of the urine was diſcharged. After much trouble, a very ſmall-ſized elaſtic catheter was paſſed into the bladder, and as it gave no pain it was allowed conſtantly to remain. For the firſt five days the urine flowed through the inſtrument, but afterwards it began to paſs along its ſides; and gradually as the urethra dilated, larger inſtruments were introduced with ſimilar good effect.

The ſilver ſtiles uſed by Mr Ware ſeem to act, in removing obſtructions of the lacrymal paſſages in fiſtula lacrymalis, on the ſame principle as the catheter appears to have done in the above example. The ſtile when firſt introduced, fills up completely the lacrymal duct; but in a ſhort time the tears begin to flow along the ſides, and paſs into the cavity of the noſe. In theſe examples it is difficult to explain the action of bougies on mere mechanical principles; it ſeems much more probable that they produce their good effects, either by a change of action of the living body, or by ſome alteration in the ſtructure of the diſeaſed parts. Says Hunter, "Preſſure produces action of the animal powers, either to adapt the parts to their new poſition or to recede by ulceration."

79 Mode of introducing the bougie. When ſpeaking of the ſymptoms of ſtricture, it was obſerved, that in order to determine with certainty their preſence, it was neceſſary to introduce a bougie. To do this, either with a view of aſcertaining the ſtate of the urethra, or in order to remove a ſtricture, a good deal of caution and nicety is required; for as the urethra is generally tender, painful, and eaſily thrown into ſpaſmodic action, any aukwardneſs might entirely prevent the poſſibility of aſcertaining the nature of the complaint, or of affording the means of relief.

When, therefore, the operation is to be performed, in order to diſcover the kind of obſtruction, bougies ought to be provided of different ſizes, of a ſoft conſiſtence, and of a cylindrical form *. One of the ſize of a common gooſe quill, or even larger, generally paſſes eaſily, and is leſs apt to meet with obſtructions before it comes to the ſtricture, than one of leſs diameter. Being of a ſoft conſiſtence, it readily takes an impreſſion of the ſtricture, and its blunt point prevents its being entangled by any accidental irregularity.

* See Plate DXIV. fig. 2.

As it ought always to be rubbed over with oil before being uſed, it generally paſſes with little more force than its own weight, till it comes to the contracted part, where it ſtops. After changing with much caution the direction of the point, by elevating or depreſſing the other extremity of the bougie, and perhaps bringing it a little backwards and then forwards, ſo as to be ſatisfied of the ſituation of the ſtricture, the inſtrument may be allowed to remain in cloſe contact with it for a few ſeconds and receive its impreſſion, ſo that when it is withdrawn, a preciſe knowledge is obtained of its ſituation and form.

Some patients are often ſo irritable, that any foreign body touching the urethra excites much irritation and pain. In ſuch caſes it is the more neceſſary not to employ the ſmalleſt force, and to uſe an application of opium, or ſuch medicine, to the perinæum, to prevent theſe inconveniences as far as poſſible.

When the ſtricture lies near the extremity of the urethra next the bladder, the point of the bougie ought always to be conſiderably bent previous to its introduction, ſo that it may readily accommodate itſelf to the curve of the urethra; for as a large inſtrument does not bend eaſily, it is apt to preſs on one of the ſide of the canal, and give riſe to the ſuſpicion of a ſtricture.

It is alſo of conſiderable importance that the point of the inſtrument be not conical *. When once we are well acquainted with the ſtate of the parts, ſuch formed inſtruments may be uſed with much advantage, as the ſmall point enters the ſtricture, and by puſhing the bougie forward it is dilated by the baſe of the cone.

* See Plate DXIV. fig. 2.

It may be alſo here remarked, that in ſome inſtances a catheter can be eaſily introduced when no bougie can be made to paſs; we ought therefore to make uſe of that inſtrument before finally deciding on the nature of the obſtruction (D).

When a ſtricture is diſcovered, and when bougies are to be uſed with a view of curing it, the firſt thing we are to attempt is to paſs one through it. As the bougie we employ is moſt frequently of a very ſmall ſize, we muſt attend particularly to the irregularities in the canal which may entangle the point of ſuch a ſmall inſtrument and the occaſional bendings it may make, while it is ſuppoſed it is paſſing forwards towards the bladder. As the mouth of the lacunæ are chiefly ſituated on the ſuperior part of the canal, the point of the bougie ought to glide along its inferior ſurface to avoid them.

The bending of the bougie is only to be prevented by a forbearance in uſing force, and in directing properly the point; but as the common bougies are apt to do this, it is often extremely uſeful to have catgut ones for this purpoſe; and it is neceſſary to have them very ſmall.

In order to overcome the obſtruction when the bougie reaches it, the ſituation of the point ought to be changed by ſhifting it backwards and forwards, and from

(D) The ſilver balls repreſented in Plate DXIV. fig. 4. have alſo been found uſeful in aſcertaining the nature of ſtrictures by Mr Charles Bell.

Strictures.

from ſide to ſide, and even employing a little preſſure, till it paſſes forwards, provided the ſurgeon has a clear and diſtinct idea of the direction of the urethra.

As the introduction of the bougie almoſt always brings on ſpaſm to a greater or leſs degree on the firſt attempt, it is often neceſſary to perſevere ſome time before it can be made to paſs the ſtricture; and we muſt continue in our endeavours a long time before we declare it impracticable.

Bliſters on the perinæum or loins, fomentations of warm water and ſpirits, turpentine glyſters, dipping the feet or glans in cold water, anodyne applications, and the internal uſe of camphor, opium, or tincture of iron, all aſſiſt in alleviating the ſpaſmodic ſymptoms when they occur, and may be ſelected for uſe according to the judgement of the ſurgeon.

Attention ought to be paid to the compoſition of the bougie; for thoſe made of elaſtic metal, catgut, or elaſtic gum, often give pain, while thoſe made of ſoft plaſter are mild and harmleſs.

The time which a bougie ought to remain in the urethra, muſt depend greatly on the peculiarities of the caſe, for there are no diſeaſes which appear under more various forms than ſtricture. In moſt caſes bougies can be introduced with little pain, and can remain for ſome minutes without inconvenience; but there are others where the introduction not only produces general irritation, but the pain is ſo violent, as hardly to allow them to enter the canal, and ſometimes they give riſe to conſtitutional ſymptoms. In the firſt caſe, from the little pain the patient ſuffers, their uſe has been abuſed, and they have been allowed to remain not only when aſleep, but they have been worn during the patient's daily employments.

It is found, however, that bougies have a more powerful effect when retained for a ſhort time, and often repeated, than when they are longer continued, but ſeldomer uſed; ſo that in no caſe, however little pain they may produce, ought they to be allowed to remain for a long time. Many indeed think that all their good effects are obtained after they have remained twenty or fifteen minutes, while others allow them to remain for one or more hours.

In caſes of ſtricture accompanied with much irritation, whatever pain the bougie may bring on, it ought not to be thrown aſide, but it ſhould be introduced repeatedly whenever there is the leaſt abatement of the ſymptoms. This practice ſhould be continued for weeks before we deſpair of ſucceſs, as afterwards the pain, from daily habit, will be diminiſhed, and the patient will be gradually more and more able to bear it. Whilſt we continue the uſe of the bougie, it ought gradually to be increaſed in ſize as the ſtricture gives way, and be introduced once or perhaps twice a-day till the obſtruction is no longer felt, and till the urine flows in a full, even, and natural ſtream.

When this happens we are not to conſider the cure as altogether complete; for it is very generally found, that if the uſe of the bougie is at this time given up, the parts ſoon begin to contract again, as they have ſtill a diſpoſition to return to their former ſituation, and the diſeaſe in a ſhort time is completely renewed. It will therefore be proper to continue uſing them at diſtant intervals, ſome time after the cure appears complete, and give them up in a very ſlow and gradual manner.

It may be here mentioned, that it is not neceſſary to retain the point of the bougie in the cavity of the bladder, but merely to allow it to paſs the ſtricture.

Of the Cauſtic. 80

In ſpeaking of the uſe of bougies, we have ſuppoſed that it has been practicable to paſs one through the ſtricture; but it is well known, that caſes do often occur, where, from the tortuous form the canal has aſſumed, the ſmalleſt bougie is prevented from entering the bladder.

In ſuch caſes, preſſure was employed on the diſeaſed parts, in order to produce ulceration to deſtroy the obſtruction; but as this mode was found in many caſes to be followed with violent inflammation, and attended with great pain, it was not often performed.

Laying open the ſinuſes, and diſſecting out the diſeaſed parts, was alſo a painful and no leſs difficult operation, ſo that no eaſy mode was ever adopted till Wiſeman employed lunar cauſtic.

From the delicate ſtructure of the urinary canal, it was not without much caution, and in very urgent caſes, that this remedy was firſt employed; but ſince its action was found not to be ſo violent, it has been freely uſed by many ſurgeons, and its application not confined to the more advanced ſtages of the complaint.

From the time of Wiſeman to that of Mr J. Hunter, we find little worthy of remark in ſurgical writers regarding the uſe of cauſtic. The latter of theſe authors, however, again introduced it into practice, and applied it to all thoſe caſes where he could either do no good with bougies, or when he could not paſs them through the ſtricture. In his firſt trials he met with ſucceſs; and as he ſoon improved the mode of its application, he was able to employ it with conſiderable advantage.

Mr Hunter's mode of applying cauſtic was firſt adopted by Wiſeman; but as the ſilver canula which he employed, not only gave much pain, but could not be introduced as far down the urethra as a common bougie in many inſtances, and as the cauſtic could not be applied directly to the centre of the obſtruction, a new mode was invented. A piece of cauſtic was fixed in the extremity of a common bougie, and covered with the plaſter except at the extremity, where a part was expoſed, but ſo ſmall as merely to form the apex of the conical point of the bougie. In this manner it is found poſſible to apply it to almoſt all caſes, and when in dexterous hands, may be uſed with conſiderable ſafety. When it is to be applied to a ſtricture, it is neceſſary that ſome previous knowledge of the caſe has been obtained from the introduction of a ſoft bougie. When this has been done, the armed bougie muſt be introduced rather quickly, but ſteadily, till it meets the ſtricture, which we know both from the feel, and from the ſituation previouſly determined. When brought into contact with the ſtricture, it is perhaps better merely to touch it with the cauſtic the two or three firſt applications, and afterwards it may be retained longer. When the bougie is to be withdrawn, it ought to be done cautiouſly; for as it has become ſoft, and the cauſtic not ſo firmly fixed in it, it may fall out, and be left behind in the urethra. Although

Strictures.

this mode has advantages over the ſilver canula formerly employed, yet there is a way which we think may be attended with conſiderable ſuperiority, as it not only requires leſs dexterity on the part of the ſurgeon, but is leſs apt to do miſchief.

It is evident, that when the armed bougie is paſſed to a ſtricture, it will unavoidably touch ſeveral parts of the ſide of the canal in its paſſage; and as often its introduction brings on a ſpaſm, which laſts ſome ſeconds, or even minutes, a conſiderable portion of cauſtic may be diſſolved on the ſound membrane.

The frequency of the application of the cauſtic muſt be determined by the particular circumſtances of the caſe. It ſhould never be repeated till after the effects of the firſt application have ceaſed; in general, every ſecond day will be found to be enough, but in ſome inſtances it may be applied daily.

After the uſe of the cauſtic, the patient ought to be kept quiet; he ſhould not make any exertions to empty the bladder, nor take any violent exerciſe. In general the pain from the cauſtic laſts but a few minutes; and the day following, when the ſlough ſeparates, a rawneſs is felt on making water.

81 Bad effects of cauſtic.

The application of cauſtic to the urethra is, however, often followed by a train of very alarming ſymptoms; inſtead of a mere burning heat in the parts, the patient is ſeized with violent pain, followed by retention of urine, ſwelling of the teſticles and perinæum, hæmorrhagy, and ſometimes, a complete febrile paroxyſm.

From the ſympathy that exiſts betwixt the urethra and teſticles, it is not unfrequent to find diſeaſes of the former produce morbid affections of the latter.

Stone of the bladder and the uſe of common bougies often bring on ſwelling on one or both of the teſticles; and in one caſe the irritation of a bougie brought on an inflammation, which terminated in a hydrocele of the vaginal coat. It is a frequent effect of cauſtic, but ſoon diſappears when its uſe is given up.

82 Strangury.

Strangury has often followed the application of cauſtic after any imprudence on the part of the patient; and it generally happens in thoſe caſes where it has been applied near the bladder. This may happen not only from the great ſuſceptibility this part of the canal has to contract; but it may ariſe from the bougie paſſing a part of the urethra where cauſtic had been formerly applied, and which remained ſtill tender. This retention of urine in general does not continue long, and in moſt caſes it is relieved by the introduction of a bougie, or the application of a bliſter.

83 Hæmorrhagy.

When cauſtic has not only deſtroyed the ſtricture, but its action extended to the ſound parts, blood is often poured out into the canal, or is effuſed into the cellular texture of the penis. The hæmorrhage is ſometimes very profuſe, and ſeems to proceed from an eroſion of the ſpongy bodies; but as it has, in every caſe hitherto publiſhed, ceaſed of itſelf, no particular means have been found neceſſary to ſtop it. Keeping the parts cool, and giving cold acid drinks, quietneſs, and caution againſt all cauſes of irritation, ſhould be attended to. The tumor compoſed of effuſed blood generally gives little inconvenience, and like an ecchimoſis on any other part, it may be removed by the topical application of ſtimulants.

By far the moſt ſerious and moſt alarming ſymptom which ariſes from the uſe of cauſtic is an ague or febrile fit. It begins with a ſevere cold ſtage, which continues from fifteen minutes to an hour. This is followed by another fit, which laſts ſometimes ſeveral hours, and is ſucceeded by a very profuſe perſpiration, which is much greater than what happens in common ague. Theſe paroxyſms do not return at the ſame periods, and ſeldom occur more than two or three times. When repeated, they become more and more ſevere, and every future application of the cauſtic brings on one ſix or twelve minutes after. Patients attacked in this manner become extremely debilitated; and three inſtances have come under our immediate knowledge where it proved fatal. When ſuch a ſymptom occurs, the cauſtic ought to be immediately laid aſide, emollients applied to the urethra, and the patient ſupported by cordials.

Strictures.

84 Febrile fit.

85 Falling out of the cauſtic.

The cauſtic too has been ſometimes known to fall out of the bougie, and diſſolve in the urethra. When ſuch an accident happens, if it be not immediately removed, it may produce a ſlough of almoſt the whole extent of the canal, and bring on very alarming ſymptoms.

86 Mode of applying the cauſtic.

In place, therefore, of fixing a large piece of cauſtic in the bougie, take ſuch a quantity as is intended to be diſſolved on the ſtricture; reduce it into a fine powder, and ſtick it on the point of the bougie, by preſſing them on one another. When this is done, it may be dipped in warm wax, and receive a thin covering of it.

A bougie prepared in this manner may be introduced down to the ſtricture without any riſk of injuring the ſound membrane; for as the thin layer of wax which covers the cauſtic, prevents it being immediately diſſolved, it is not till it has been kept ſome time in contact with the ſtricture that it begins to act. By following this plan we not only avoid injuring the internal membrane, but we diſſolve no more of the cauſtic on the diſeaſed parts than what is wiſhed for, and there is no riſk from a portion of cauſtic being left behind.

There are, however, caſes where a ſoft bougie cannot be ſo eaſily introduced as a metallic inſtrument: in them, a ſilver catheter, or one made of Smith's elaſtic metal, may be uſed with much advantage.

Inſtead of the holes being made at the ſides of the inſtrument, it ought to be perforated at the extremity, and this hole filled with cauſtic, and fixed in that ſituation with adheſive plaſter. Or, what anſwers equally well, the catheter may be introduced down to the obſtruction, and an armed bougie paſſed through it.

Comparative advantages of the Bougie and Cauſtic. 87

Thus far we have mentioned the manner in which the bougie or cauſtic are to be employed; we now come to conſider the peculiar merits of thoſe two modes of practice, and to point out thoſe caſes where the one is to be employed in preference to the other.

Notwithſtanding the zealous advocates which have lately introduced cauſtic as a general remedy for ſtrictures, we have no heſitation in declaring it as our opinion, that the ſimple bougie is the inſtrument to be preferred in the generality of caſes of this diſeaſe, and that in all caſes where the cure can be accompliſhed by its means, it ſhould be adopted. Cauſtic, however, is a remedy by no means leſs beneficial, though its uſe ought to be much more circumſcribed; for we certainly believe that

Strictures.

that by its proper application many of the worſt caſes of ſtricture, caſes indeed which are quite incurable by the bougie, may be benefited by its application.

In thoſe caſes of ſpaſmodic ſtricture where the common bougie either cannot paſs the ſtrictured part, or where it has no effect in relieving the ſymptoms, cauſtic may be uſed with advantage.

It may be alſo employed whenever the ſtricture is attended with much pain and irritation or conſtitutional ſymptoms; and in caſes where the contraction of the urethra is ſuch, as entirely to cloſe up the canal, and the urine to come through fiſtulous openings in the ſcrotum and perinæum, the uſe of cauſtic is attended with the beſt effects. We have met with caſes, where during a ſucceſſion of years, urine has drilled through fiſtulous openings in the ſcrotum, in which ſix, eight, or ten applications of the cauſtic bougie have opened a free paſſage into the bladder, and allowed all the fiſtulas to heal up.

From the rapidity of the cures performed by cauſtic in compariſon to thoſe of the bougie, the former a few years ago came into very general uſe, and was tried by different ſurgeons all over this iſland in every poſſible variety of the diſeaſe. In this extenſive field of experiment the merits of cauſtic have been fairly balanced, and its exaggerated good effects have fallen into diſrepute, whilſt the calumnious reports of its fatal and dreadful conſequences in the hands of experienced men, have been ſhown to be without foundation. Thus in the midſt of medical rancour and diſpute, cautious and intelligent men have become acquainted with the good qualities of a moſt active application; and an unprejudiced mind has laid open before it a vaſt field of obſervation on a diſeaſe which deeply intereſts a conſiderable number of men.

88 SECT. II. *Of Strictures in the Oeſophagus.*

The mucous membrane lining the œſophagus, like that of the urethra, is liable to become contracted, forming a ſtricture. Theſe contractions may be formed at any part of the canal; but it is obſerved that there is one ſpot more liable than any other to become affected with it. The part alluded to is immediately behind the cricoid cartilages of the larynx, where the fauces may be ſaid to terminate, and the œſophagus begin. The diſeaſe appears, on diſſection, to conſiſt of a tranſverſe fold of the internal membrane of the œſophagus, filling up in different degrees the aperture of the canal.

This part of the œſophagus is alſo liable to two other diſeaſes, whoſe ſymptoms are nearly alike, and therefore may be miſtaken for ſtricture. One of theſe is a thickening of the coats of the œſophagus, which extends to the ſurrounding parts, and in the end moſt commonly degenerates into cancer. The other is an ulcer of the lining of the œſophagus, which is commonly ſituated a little below the ordinary place of ſtricture, and upon the poſterior or vertebral portion of the canal. Both of theſe complaints produce a difficulty in deglutition, and in their early ſtages are only to be diſtinguiſhed from ſtricture, by an examination with a bougie. Stricture appears to be a diſeaſe more frequent in the early periods of life; while the two other diſeaſes are more commonly met with at an advanced age.

With a view to aſcertain the true nature of the diſeaſe, it is always neceſſary to introduce a bougie. The beſt mode of doing this, is that recommended by Mr Everard Home. The patient is deſired to puſh the tongue as far as poſſible out of the mouth, thus bringing the orifice of the ſtricture as nearly as poſſible in a line with the middle of the pharynx. The bougie being oiled or covered with mucilage, is then to be thruſt down into the œſophagus. When the bougie paſſes down to the diſtance of eight inches, meaſuring from the cutting edge of the front teeth in the upper jaw, the ſurgeon may be ſatisfied that it has gone beyond the uſual ſeat of ſtricture; and if it is brought back without any reſiſtance, he may conclude that the aperture of the œſophagus conſiderably exceeds the ſize of the bougie which has been uſed. But if the bougie ſtops at ſix inches or even lower, he is to retain it there with a uniform ſteady preſſure for half a minute, ſo as to receive on its point an impreſſion on the ſurface to which it was oppoſed. If the end of the bougie retains its natural form, or nearly ſo, and there is an indentation like the mark of a cord on its ſide, whether all round or only partially, he may decide that the diſeaſe is a ſtricture. But if, on the other hand, the bougie paſſes without any difficulty to the diſtance of ſeven inches and a half, and when brought back the point has an irregular jagged ſurface, it is equally clear that the diſeaſe is an ulcer on the poſterior ſurface of the œſophagus.

When ſtrictures of the œſophagus have been of long continuance, ulceration takes place on the ſide of the ſtricture next the ſtomach. When ſuch ulceration takes place, the character of the original diſeaſe is loſt; and when the ulceration extends upwards, the ſtricture itſelf is deſtroyed. A bougie paſſed under ſuch circumſtances, will, in general, have its point entangled in the ulcer; and when ſo ſkilfully directed as to go down into the œſophagus, it will meet with a difficulty while it is paſſing from the ſound œſophagus to the ulcer, and again when it leaves the ulcer and reenters the ſound canal below; and in its return there will alſo be two parts at which a reſiſtance is felt. This may miſlead the moſt accurate obſerver, and create a belief that there are two ſtrictures, whereas in fact there is none but an ulcer of ſome extent, and a power of contraction in the upper and lower extremities of the œſophagus where they terminate in the ulcer.

Treatment.—The treatment of ſtricture in the œſophagus is to be conducted on the ſame general principles as ſtricture in the urethra.

89 Bougies which are made much longer and of larger dimenſions than thoſe for the urethra, may be uſed with the greateſt ſafety. At firſt, indeed, they ſometimes create a good deal of irritation and a febrile attack; and in ſuch caſes they muſt be employed with the greateſt caution. Once in twenty-four or forty-eight hours, according to the nature of the caſe, will be ſufficiently often to introduce them; and they may be diſcontinued in proportion to the alleviation of the ſymptoms. The uſe of cauſtic in this ſpecies of ſtricture has alſo been not only propoſed, but adopted; a practice which is more a proof of the boldneſs of its inventor than of his prudence *. It is not to be denied, that ſome desperate caſes of the diſeaſe may occur, where every remedy proves uſeleſs, and that in theſe, the cauſtic bougie,

* *Home on Strictures.*

Strictures. bougie, introduced and applied to the ſtricture with much dexterity, may be beneficial. But theſe caſes are ſo rare, and there are ſo few able to uſe this active remedy properly, that we cannot help thinking it can never be very generally introduced into practice.

90 SECT. III. *Stricture of the Rectum.*

As far as we know, there is no author who has given any accurate account of the various morbid appearances of the extremity of the rectum. Under the general name of *hæmorrhoids*, a variety of tumors very different from one another have been claſſed; whilſt under the name of *ſchirrus*, have been conſidered all caſes where the diameter of the lower part of the inteſtinal canal has been diminiſhed. In a practical point of view, theſe obſervations are of the greateſt importance, as they lead the ſurgeon to diſcriminate between thoſe caſes which are likely to be aided by the uſe of medicines, and thoſe which are beyond the reach of art, or which the ſame mode of treatment might tend more to aggravate than to alleviate.

In many caſes of the true ſcirrhus, or cancerous affection of the inteſtine, the diſeaſe firſt appears by the formation of one or more griſtly tumors on the internal ſurface of the canal; and theſe by increaſing in number and in ſize, and by involving the adjacent parts, contract the canal, and at laſt ulcerate, forming true cancerous ſores. But there is another claſs of caſes, in which the diameter of the inteſtines becomes narrowed by a thickening of its coats, and which, were we to reaſon from analogy, might be compared to that thickening which forms ſtricture in the other mucous ſurfaces, as in the œſophagus and urethra. It is the ame caſes that we ſuſpect Deſſault treated with ſo much ſucceſs by the uſe of bougies*; and from the good effects of this mode of treatment in caſes of ſtricture in other parts of the body, it is reaſonable to expect benefit from their uſe in ſtrictures of the rectum. Deſſault, however, wiſhes it to be underſtood that the practice is to be employed in the true ſchirrus; but the two caſes which are given in detail by Bichât in his edition of Deſſault's works, in illuſtration of the practice in ſchirrus, are by no means concluſive. The firſt is a caſe of tumors of the internal membrane, which were much alleviated by the compreſſion of a bougie; whilſt the ſecond was a caſe which ſhows the relief to be obtained by the uſe of bougies in caſes of ſchirrous contraction in the diſcharge of the fæces, but by no means in the cure of the diſeaſe.

* *Oeuvres Chirurgicales.*

In caſes, therefore, of contraction of the rectum which are not of a ſcirrhous nature, beſides the ſtrict attention to keep the bowels regular, and render the fæces as liquid as poſſible by the uſe of laxatives and emolient injections, bougies made of a proper ſize may be uſed with relief; and, as we have mentioned in another place, the practice is alſo highly ſerviceable in ſome caſes of tumors which grow from this part of the inteſtine.

91 SECT. IV. *Of Polypi.*

When the mucous membrane of any part of the body becomes elevated above its natural level, ſo as to form a circumſcribed ſwelling, the diſeaſe is called a *polypus*.

Polypi have been found on all the different mucous ſurfaces; in the noſe, frontal and maxillary ſinuſes, pharynx, gullet, mouth and gums, meatus externus, conjunctiva, ſtomach, inteſtines, rectum, uterus, vagina, bladder, and urethra. Of Polypi.

There are four different kinds of polypi, varying from each other in their ſtructure. 1ſt, The *mucous*; 2d, the *fleſhy*, 3d, the *carcinomatous*; and 4th, the *encyſted* polypi.

The *mucous* polypi have a ſlippery ſurface, and are conſtantly covered with a quantity of mucus. They are of a greyiſh or dull white colour, and have a demi-tranſparent appearance, reſembling, particularly at their extremities, a piece of ſoftened glue. They are eaſily torn and bleed freely; they are neither painful nor ſenſible to the touch; they ſuffer remarkable alterations from changes in the ſtate of the atmoſphere, extending prodigiouſly in cold and moiſt, and contracting in a dry and warm air. They are of an irregular and angular ſhape, and often ſeem to take the particular form of the cavity in which they grow. They are commonly attached by a narrow neck, and are quite moveable.

The *fleſhy* or carcinomatous polypi are of a bright red colour, their ſurface is ſmooth and regular. They are of a rounded form, and are attached by a narrow neck. They are firmer and are not ſo eaſily torn, nor do they bleed ſo readily as thoſe of the mucous kind.

The *carcinomatous* polypi are of a darker red or more purple colour than thoſe of the fleſhy kind, and ſometimes they are of a livid hue. They are ſupplied by a great number of blood-veſſels, which makes them bleed profuſely even when ſlightly injured, or gives them a diſpoſition to bleed of themſelves. They are of a very hard firm ſtructure; ſome of them are as hard as cartilage. They are more or leſs painful, and are very ſenſible to the touch. Sometimes the pain is of that ſtinging lancinating kind which carcinomatous tumors have in other parts of the body. Their ſurface ſometimes ulcerates, and the ulcer aſſumes all the characters of a cancerous ſore. They are commonly attached by a firm broad baſis.

The *encyſted* polypi occur leaſt frequently. Richter ſays that they reſemble a reticular ſac, which contains fluid ſometimes reſembling mucus; at other times it is of a thick conſiſtence. In one caſe we found the mucous membrane covering the ſuperior ſpongy bones extended, but not much thickened; and between its folds there were ſeveral round ſemitranſparent veſicles, containing a thick glairy fluid.

SECT. V. *Of Polypi of the Noſe.* 92

All the four different kinds of polypi have been found growing from the mucous membrane lining the cavity of the noſe; we have alſo ſeen the ſuperior ſpongy bone ſo increaſed in bulk, as to form a tumor reſembling the fleſhy polypus.

The firſt ſymptom of a polypus in the noſe is a preternatural degree of redneſs of its mucous ſurface. It becomes ſpongy and callous, and there is an increaſed ſecretion of mucus. The patient has ſome interruption in breathing, and the voice is rendered more or leſs indiſtinct; he feels as if ſtifled, and he tries to get quit of

Of Polypi.

of something which incommodes him by blowing his nose, for the same reason as a person does who labours under a common catarrh; the sense of smell becomes impaired, and all these symptoms are more troublesome in wet than in dry weather.

The symptoms increase till the extension of the mucous membrane increases to such a degree, as to form a distinct circumscribed tumor; and the progress of the complaint is generally so slow, that its nature is frequently not suspected till it gets this length.

By degrees the breathing through the nose and the sense of smell are entirely destroyed from the mechanical obstruction of the tumor; and the patient himself finds, that by a violent expiration or inspiration, the tumour can be pushed forward or backward in the nose.

The pressure which a *polypus* sometimes makes on the nasal duct prevents the tears from flowing freely into the nose, and is the cause of a watery eye.

When the tumor is large, the septum of the nose is frequently pressed on, and pushed to the opposite side, and then the respiration is oppressed in both nostrils. Sometimes the tumor descends, and part of it projects through the nostril; when this takes place, the surface of the part exposed to the air becomes like common skin. This indeed happens when any mucous surface is exposed. We have observed it in the vagina when it was inverted, and in the eyelid when the palpebral membrane was turned outwards, from a tumor, or any other cause.

Morgagni takes particular notice that the natural position of the septum is apt to be mistaken for disease, as it very frequently divides the nasal cavity into two unequal portions.

More frequently polypi extend backward into the pharynx, and can be felt by introducing the finger behind the velum pendulum palati. In one rare instance, we have known a polypus so large, as to descend along the œsophagus into the stomach, and in another to fill up the whole cavity of the mouth, and produce suffocation.

It happens also that polypi growing from an extensive base, separate, displace, and produce an absorption of the bones which surround them. The bones of the nose are pushed upward; the maxillary bones and the palate bones are disjoined, and carried outward; the arch of the palate depressed; the inferior margins of the orbits are pressed upward, and push the eyes out of their orbits.

Polypi are found to arise from every part of the nasal cavity; but most frequently from the inferior spongy bones. Many surgeons have conceived that polypi arose from general diseases of the constitution, as scrofula, syphilis, &c.; but it will in general be found to be a mere local disease, and probably to arise from whatever tends to produce a continued or repeated attack of inflammation in the part.

93 *Treatment.*—If polypi are attached to the upper spongy bones, their removal will be more dangerous, as the inflammation excited by an operation will be readily conveyed to the brain. When they are attached to the inferior spongy bones, they can be removed with perfect safety.

The most celebrated surgeons have never advised any operation when the tumor is small and gives no distress; but whenever it becomes of such a size as to fill up the cavity of the nostril, disturb respiration, and assume a malign aspect, it ought to be removed.

As long as polypi continue small, or when the mucous membrane acquires that appearance which indicates the commencement of the disease, tonic and astringent remedies are generally recommended, as decoction of oak bark, with alum; strong solutions of white vitriol, saccharum saturni, or muriate of mercury, ardent spirits, and vinegar. Either of these solutions, which may be selected, ought to be thrown up a little warm into the nasal cavity with a syringe, retained there half a minute or more, and repeated four or five times daily; or a piece of charpee wet with them may be put into the nose with a probe, and applied to the diseased surface. Kino, galls, white vitriol, &c. sabine in the form of powder, snuffed up into the nose, as strong as the patient can suffer it, are also useful in stopping the progress of the disease. Mercury has been found rather to make them worse; caustic and other corroding applications have been of use in the softer kind, though they have never produced a cure. Bougies have been recommended by Mr B. Bell, and are said to have been useful; and when the polypus is small, they may act on the same principle as bougies do on tumors of the rectum, a practice so successful in the hands of Dessault.

Polypi may be removed either by tying a ligature round their neck, by tearing or twisting them, or by cutting them out with a knife or scissars.

Operation.—Professor Richter of Gottingen, and several eminent practitioners of this country, use, in general, the forceps; and in those cases where the polypus is attached to the inferior spongy bones, or to any of the inferior part of the nasal cavity, this mode of operation is much more easily performed, and has the best chance of success. 94

From the soft spongy texture of the superior spongy bones, and ethmoid bone, with which they are connected, there is a considerable risk of tearing and injuring more parts than is necessary for the removal of the polypus; and, as any inflammation excited on these may spread to the membranes of the brain, it is more adviseable to remove polypi attached to these parts by the ligature.

When polypi are completely within the reach of the knife, adhering towards the external opening of the nostrils, they may be easily cut away.

In performing any operation, or even making an examination of the state of the nose, it is of considerable importance to attend to the position of the forehead, and to employ a proper light.

The head should be bent backwards; and in order to enlarge the external nostril, an assistant, on whose breast the head of the patient rests, ought, with the fore-finger of his right hand, to press upward the point of the nose; whilst, with a probe in his left, he spreads out the alæ.

Of removing Polypi with the Forceps.—Forceps for this purpose ought to be six inches or six inches and a half long, and the axis at two-thirds of their length distant from the extremity of the handle; so that the operator may have the advantage of a long lever. See Fig. 1. Plate DXV. 95 Plate DXV. Fig. 1.

The points of them ought to be blunt, rounded on the outside, perforated, and a concavity, made rough, extending

extending to near the axis. The two blades ought to be ſeparated at their union, when cloſed, and not to become parallel till they are opened to a conſiderable diſtance, in order that the polypus may be held very firmly. The blades ſhould be ſtrong, and pretty broad.

Even this form of forceps is not always ſufficient; and it is uſeful to have a pair of ſuch as has been recommended by Richter *. They are intended to be employed in thoſe caſes, where the polypus is ſo large as completely to fill the noſtril, and ſo hard, that the upper part of the blades of the common forceps cannot ſufficiently dilate to allow their extremity to paſs down the noſtril, and reach the bottom or neck of the tumor.

* See Plate DXV. fig. 2.

It is of great importance to fix the forceps as near the root of the polypus as poſſible; for, when that is accompliſhed, the whole maſs may be at once removed: and the hæmorrhagy is never ſo great as if the polypus was torn through the middle.

Often, however, it happens, that the polypus is ſo large as to diſtend the noſtrils in ſuch a manner, that it is impoſſible to diſcover the root till the extremity is removed. We muſt, in ſuch a caſe, remove as much as we are able, and even although the bleeding is profuſe, perſevere in the operation as long as we can pull any away with ſafety.

When the operation is to be performed, the patient ought, by his own efforts, to puſh the body as far forwards as poſſible; then the ſurgeon, with a pair of ſmall forceps in his left hand, ſeizes the point of the polypus, and having kept faſt hold of it, he cautiouſly introduces the polypus forceps on the outſide of the others. The more time that is beſtowed on this ſtep of the operation, the more the polypus becomes elongated and thinner, the more room is given for the forceps, and therefore the higher up can the polypus be graſped. After it is completely ſecured between the blades of the forceps, it is to be twiſted ſlowly round, and at the ſame time pulled outwards. If only a portion of the polypus is removed, what remains is to be extracted in the ſame manner. The hæmorrhagy is generally profuſe, but ſeldom requires the aſſiſtance of art to ſtop it.

96 *Of Removing Polypi by the Ligature.*—The ligatures conſiſt of wire, catgut, ſilk or cord; and different methods have been employed for paſſing them round the root of the polypus. In order to remove a polypus, the anterior part of which is ſituated in one of the noſtrils, a ligature (*a*) † is to be introduced through a double canula (*b*), and one end fixed round the ring (*c*); whilſt the other end (*d*) being looſe, allows the nooſe at *a*, to be increaſed or diminiſhed, according to the ſize of the polypus. The polypus is to be graſped by a pair of forceps put through the nooſe, and drawn forwards. The ligature is then to be carried to the root of the polypus, either by means of the forked probe (fig. 4.), or by one of the porte-nœuds (fig. 5.), taking care to tighten the wire gradually, the further the inſtrument is introduced. When the nooſe reaches the root of the polypus, the ligature is to be firmly drawn, and ſecured by being twiſted round the ring of the canula. If the polypus hangs down behind the velum pendulum palati, the doubled wire is to be ſlowly inſinuated through the noſtril into the throat. The finger of the ſurgeon is to be introduced into the mouth, and by opening its doubling the nooſe paſſed over the extremity of the polypus, and conducted to its root, by gradually tightening the ligature, and then it is to be firmly fixed. The ligature ſhould be tightened once or twice a-day, until the tumor entirely ſeparates. As there is generally a conſiderable degree of ſwelling and inflammation of the tumor before this takes place, if it be ſo ſituated as to diſturb reſpiration, it may even be neceſſary to perform bronchotomy as a preliminary ſtep. Should any part of the polypus remain, it may be deſtroyed by cauſtic, or the actual cautery, if practicable.

† Plate DXV. fig. 3.

Beſides this, which is the common and moſt ſimple mode of applying the ligatures, there are others which are well adapted for particular caſes. The apparatus employed by Deſſault is extremely ingenious and well-ſuited for its purpoſe, but is more particularly uſeful in polypi of the vagina and uterus.

97 Deſſault's apparatus.

When this apparatus is to be uſed, two porte-nœuds (*a a*) ought to be procured, and having puſhed the cylinder over the branches of the ſtalk, ſo as to ſhut the rings (*d*) completely, a ligature of waxed thread, catgut, or ſilver wire, is to be paſſed through them (*k*), and the extremities may be either held along with the canula or ſecured at *e* *.

* See Plate DXV. Fig. 5.

The two canulas, thus armed, are introduced parallel to one another between the tumor and parietes of the cavity in which it lies; and when they reach its baſe, one is held firm, and the other carried round the baſe, croſſed over the other, forming a nooſe round it.

The ligature being pulled tight by an aſſiſtant, the two ends are to be put through the hole (*g*) of the other canula, and fixed to the axis at *h*.

The extremity (*g*) is then to be ſlipt along the ligature cloſe to the polypus; and the ligature being firmly fixed to the other extremity, the two porte-nœuds may be at once removed, by allowing the ring to divide, and the ligature to eſcape.

This being done, nothing remains to complete the operation. The ligature is kept round the polypus till it drops off, and as the parts begin to give way, it ought to be retained always perfectly tight; and this may be eaſily accompliſhed by turning the ſcrew at *h*.

The apparatus, too, (fig. 6. Plate DXV.) may alſo be ſometimes uſeful, from the flexibility of the canula, which conveys and directs the ligature.

2. *Of the Polypus of the Rectum.* 98

Polypi of the rectum differ conſiderably from the common *hæmorrhoidal* tumor, in their ſymptoms and appearances. They reſemble the fleſhy polypi in other parts of the body, in their colour and external form, and they are alſo ſometimes ulcerated on the ſurface. On cutting through a large tumor of this kind, we found it compoſed of a vaſt number of cells, ſome of them very large, and all of them filled with blood. Their progreſs is ſlow, and we have ſeen them grow as big as a large walnut. They do not alter their ſize at different times, as is obſerved in the hæmorrhoidal tumor, except that they are apt to ſwell, when allowed to remain long external to the anus. They are moſt commonly ſituated in the rectum, cloſe to the anus; ſo that when the patient goes to ſtool they are puſhed downwards,

downwards, and appear externally. When very large, they are alſo apt to come through the anus by the leaſt exertion in walking. They are generally attended with more or leſs pain or uneaſineſs on going to ſtool; and when they become ſo large as to come through the anus in walking, the diſeaſe becomes very diſtreſſing. They are often accompanied with a diſcharge of mucus. Sometimes, too, hæmorrhoidal tumors are formed contiguous to the polypus; but the latter is generally pointed out by the patient as the original ſwelling, and that which gives moſt pain. Theſe tumors may alſo be readily diſtinguiſhed from one another by their difference in colour and general form.

99 *Treatment.*—Aſtringents, with opium, and bougies, may alleviate the ſymptoms; but as they ſeldom give permanent relief, the moſt complete and ſafeſt mode of cure is removing them with the knife, if they can be readily reached; if not, the ligature is preferable, although it gives much more pain; for it ſometimes happens, that a very profuſe bleeding follows after they have been cut away. The hæmorrhoidal tumors which accompany the polypus diſappear after its removal.

When they are tied with a ligature, this can be done in moſt caſes by ſimply tying a ſtrong ſilk thread firmly round the baſe of the tumor. Often the baſe is larger than the apex, and then it is neceſſary to paſs through the middle of the tumor a curved needle with two ligatures, one to tie each half of it. To prevent any miſtake, and accelerate the operation, ſurgeons make one of the ligatures of black, and the other of white thread. Whilſt the mortified part is ſeparating, great attention is neceſſary to keep the ſurrounding parts from excoriating; and this is to be done by frequently waſhing with warm water, or a ſaturnine ſolution, and anointing them with ſaturnine ointments, or the unguentum reſinoſum. Fig. 7. Plate DXV. gives an outline of tumors of this kind.

100 ### 3. *Polypi of the Gums*

Moſt frequently are connected with a carious tooth, or of the alveolar proceſſes of the jaw bone; ſometimes, however, not. They are generally of a firm fleſhy texture, rounded form, poliſhed ſurface, and are very apt to bleed; and they ſometimes grow to a very large ſize, and become malignant. They are beſt removed by the knife; and, as they bleed profuſely, it is often neceſſary to uſe the actual cautery to reſtrain it. If the bone is found carious, the diſeaſed part ſhould, if poſſible, be removed, or means uſed to aſſiſt and promote its exfoliation; and when this has taken place the polypus often diſappears without any operation.

101 ### 4. *Polypus of the Frontal Sinus.*

This is a very rare diſeaſe, and it produces the ſame dreadful conſequences as that of the antrum. Art can perhaps venture to do little, as the cloſe connection to the brain would render any attempt to remove it dangerous.

102 ### 5. *Polypus of the Antrum Maxillare.*

The ſurgeon is ſeldom aware of the preſence of this diſeaſe until it is far advanced, and has begun to diſtend the bony cavity in which it is formed. It ſometimes acquires a prodigious bulk, ſeparating and rendering carious the bones of the face, puſhing the eyeball out of the orbit, and filling up the cavity of the mouth. If the nature of the complaint is early ſuſpected, by removing a portion of the external parietes of the antrum with a trephine, the polypus may perhaps be removed from its attachments; but if that is impracticable, ſtrong aſtringent applications, cauſtic or the actual cautery, or removing portions by the knife, may arreſt the progreſs of the diſeaſe.

6. *Polypi of the Urethra.* 103

Theſe are what have been called caruncles, and were ſuppoſed to be the moſt common cauſe of ſtricture. It is now, however, well known that they occur ſeldom. If their growth is not checked by the uſe of a bougie, and if they are not near the meatus urinarius, it may be neceſſary in ſome caſes to cut in upon the urethra, in order to get them extirpated; but that muſt happen rarely.

7. *Polypi of the Bladder* 104

Are beyond the reach of the ſurgeon, but they occur very rarely; and the diſtreſſing ſymptoms which attend this diſeaſe, can only be alleviated by thoſe internal medicines which dilute the urine and allay the irritability of the bladder.

8. *Polypi of the Ear.* 105

They ſometimes grow from the membrana tympani, but they generally ariſe from the cavity of the tympanum, after the membrana tympani has been deſtroyed by ulceration. They reſemble the common mucous polypi in ſtructure; and they are moſt frequently accompanied by a diſcharge of puriform matter and a total loſs of hearing. They may be removed with a ligature in moſt caſes very eaſily; or they may be torn out with forceps; and it is always neceſſary to touch the part to which they adhered repeatedly with cauſtic, and to uſe ſtrong aſtringent waſhes, in order to prevent their future growth.

9. *Polypus of the Conjunctiva.* 106

We have never obſerved them on the conjunctiva covering the eyeball; but they are formed on the inner membrane of the eyelids, and moſt frequently on the upper one. They are ſoft pendulous maſſes, which, being looſe, float between the eyelid and ball, and ſometimes even paſs beyond the edge of the lids. They are of the red colour of the inflamed mucous membrane; but thoſe portions which are expoſed to the external atmoſphere become dry, and often drop off. They are often formed in conſequence of the membrane being inflamed by the abſceſs burſting internally. They are eaſily removed by the knife; and they are prevented from being regenerated, by ſlight ſcarifications or the application of lunar cauſtic to the baſe.

10. *Of the Polypus of the Uterus.* 107

Theſe polypi are found to grow either from the fundus, the lower edge of the os uteri, or from the inſide of the cervix. The firſt is the moſt, and the ſecond the leaſt frequent. The ſhape of the uterine polypi is generally pyriform, having a very narrow neck. They are commonly of the ſarcomatous kind; though it often happens that polypi are formed in uteri affected with

Of Aphthæ.

cancer. Polypi protruding into the vagina are apt to be miſtaken for prolapſed uteri; and this miſtake is more likely to take place in ſome caſes where the polypus acquires a large bulk in the uterus, and is ſuddenly protruded into the vagina, and ſtrangulated by the os tinci. Caſes, too, of prolapſed uteri have been miſtaken for, and treated as polypi.

The ſafeſt mode of removing uterine polypi is with the ligature. When it is ſituated in the uterus, this operation is impracticable; but when it deſcends into the vagina, it may be very readily done by the apparatus of Deſſault (Plate DXV. fig. 5.).

108 SECT. VI. *Of Aphthæ.*

The formation of aphthæ, when they are examined with care in their different degrees, may probably extend our views of the intimate ſtructure of the mucous membranes. Boerhaave conſidered them as ſmall ſuperficial ulcerations, and Stahl regarded them as tubercles or puſtules. From the preſent ſtate of our knowledge it is difficult to determine whether aphthæ ariſe from the chorion of the mucous membrane, in its papillæ, or in its mucous follicles.

Aphthæ are formed on the lips, the gums, the interior of the mouth, the tongue, the palate, the amygdalæ, the œſophagus, and alſo in the ſtomach and inteſtines. They are moſt frequent in children and old people, and they have been obſerved in people who inhabit places where the air is tainted, and who live on unwholeſome food.

The aphthæ of the adult may be conſidered as a collection, more or leſs agglomerated or inſulated, of white ſuperficial rounded tubercles, each about the ſize of a millet ſeed. Theſe tubercles diſcharge a ſerous humour; the pellicle which covers the mucous membrane is detached, and is progreſſively formed in the different parts of the mouth, and even in the reſt of the alimentary canal. They are ſometimes diſſeminated in ſolitary puſtules over the tongue, the angles of the lips, or the back part of the mouth, with a benign character. At other times they are formed and ſeemingly propagated from the interior of the œſophagus; paſs the back part of the mouth, forming a white, thick, and ſtrongly adhering cruſt; and theſe are often dangerous from a complication of typhus fever.

The aphthous tubercles vary in colour. Sometimes they are tranſparent; at other times they are white, with a certain degree of thickneſs; they are alſo ſometimes of a deep yellow colour, and ſometimes they are livid or blackiſh, a ſymptom which always indicates a greater degree of danger.

Aphthæ may alſo be frequently obſerved in people who have taken many courſes of mercury. In theſe caſes, the repeated action of the mercury on the mouth appears to leave on that organ a degree of ſenſibility or weakneſs which diſpoſes it to the diſeaſe. It happens not unfrequently that theſe aphthæ are conſidered as venereal ſores, in conſequence of the venereal diſeaſe not having been properly cured; on this ſuppoſition a new mercurial courſe is employed, which only augments the diſpoſition to aphthæ, and makes the ſores ſpread more rapidly.

The aphthæ of children are preceded by a profound ſleep, by agitation of the muſcles of the face and lips, difficulty of reſpiration, proſtration of ſtrength, feebleneſs of the pulſe, and vomiting. In the mild form of the diſeaſe, white ſuperficial ſpots appear in different parts of the mouth, which are ſeparated from one another, and the interſtices are neither red nor inflamed. The bottom of the mouth has often been diſcoloured, and the heat immoderate; there is no difficulty in ſwallowing, and the child can readily ſuckle; the ſleep is natural, and there is a ſlight diarrhœa. The ſpots during the firſt days preſerve their whiteneſs and tranſparency; they afterwards become a little yellow, exfoliate in flakes, and go away entirely about the ninth or tenth day, particularly when the child has a nurſe.

Of Hæmorrhagy from Mucous Membranes.

The confluent or gangrenous aphthæ have other characters. The ſmall puſtules are contiguous to one another, and ſpread not only over the lips, the gums, the tongue, and the interior of the cheek; but we alſo ſee them at the bottom of the throat. The mouth of the child is burning; the lips are with difficulty applied to the nipple, and ſometimes it is excoriated by their contact. Deglutition is very difficult, and the moſt ſimple drinks given in ſmall quantities, and with precaution, do not enter into the ſtomach but with pain. There is a conſtant purging of greeniſh matter, which inflames and excoriates the ſkin round the anus; the child is very feeble and heavy, and the eyes are ſunk and ſhut, and the child ſcreams. The whole interior of the mouth from the lips to the throat becomes at laſt lined with a white thick cruſt, reſembling coagulated milk. This cruſt becomes yellow, and forms a ſlough, which, after it falls off, expoſes gangrenous ulcers of a dark browniſh yellow colour.

Treatment.—In the benign form of the diſeaſe in 109
children, it is of great conſequence to get the child a good nurſe; and the affected parts may be waſhed over five or ſix times a-day with a piece of caddis dipped in a little water gruel, to which has been added a few drops of ſulphuric acid. Borax, either in powder or ſolution, has alſo been conſidered by ſome as a uſeful application. When the cruſt has ſeparated, if the remaining ulcer be painful and irritable, its ſurface may be rubbed over with nitrate of ſilver, or any other cauſtic application. Sometimes very malignant looking ulcers remain in the adult, after the ſeparation of the cruſt. In theſe caſes, cauſtic may be employed; and we have often ſeen them heal rapidly by touching their ſurfaces once a-day with a weak ſolution of corroſive ſublimate or muriatic acid. For the treatment of the confluent aphthæ, ſee MEDICINE.

SECT. VII. *General Remarks on the Hæmorrhagy from Mucous Membranes.* 110

All the mucous ſurfaces are particularly ſubject to hæmorrhagy; and this may ariſe either from a rupture of the veſſels, or the blood may be poured out by the exhalents.

The ſuperficial poſition of the veſſels, and conſequently their want of firmneſs and ſupport, expoſes them much to rupture by very ſlight concuſſions. We have examples of this in the bronchiæ, brought on by coughing; in the noſe, by ſlight blows on the head, or by violent ſneezing; and in the rectum, by ſtraining on going to ſtool. The effects of ſtones or gravel on the mucous membrane lining the urinary organs are the ſame; and even

Of Hæmorrhagy from Mucous Membranes.

even the moſt cautious introduction of a ſound or bougie into the urethra, often cauſes bleeding; or the ſlighteſt friction of polypi of the noſe and gums, or the introduction of a probe into the lachrymal paſſages. When conſidering the diſeaſes of the ſkin, we mentioned, that in ſome diſeaſes, particularly ſome peſtilential fevers, the exhalents of the ſkin poured out red blood. The ſame thing happens among the mucous membranes. We often ſee blood come from the noſe, from the bronchiæ, ſtomach, and inteſtines, urinary bladder and kidneys, where there has been no reaſon to ſuppoſe ulceration previouſly to have taken place, or any thing to cauſe a rupture of any of the veſſels.

111 1. *Hæmorrhagy from the Noſe.*

Hæmorrhagy from the noſe ariſes from a variety of cauſes. We often obſerve it after fevers, and then it has been conſidered as critical. In young people it occurs very frequently, and from very ſlight cauſes; and it has been ſometimes known to take place at the menſtrual period.

Hæmorrhagy from the noſe is generally preceded by ſymptoms of an increaſed quantity of blood to the head, pulſating motion of the temporal arteries, feeling of weight about the head, ſymptoms which are preceded or accompanied by other changes in more diſtant parts; ſuch as ſpontaneous laſſitude, pains about the belly.

When the means mentioned for this complaint in the article MEDICINE have failed, recourſe muſt be had to compreſſion. Doſſils of lint introduced into the noſtrils are ſometimes effectual; or the gut of ſome ſmall animal, tied at one end, then introduced by a probe into the noſe as far as the pharynx, and filled with cold water, or water and vinegar, and ſecured by a ligature, by adapting itſelf to all the parts, and preſſing equally on them, has been attended with advantage. When theſe remedies likewiſe fail in their effect, a piece of catgut or wire may be introduced through the noſe into the throat, and brought out at the mouth; a piece of ſponge, or a bolſter of lint of a ſize ſufficient to fill the back-part of the noſtril, is then to be fixed to it; the ſponge is next to be drawn back and properly applied. Another is to be applied to the anterior part of the noſtril and ſecured. The ſame may be done to the other noſtril, if it be neceſſary; or the ſponge may be of ſuch a ſize as to fill the ends of both noſtrils at the ſame time. By this contrivance the blood not finding an outlet, will ſoon coagulate, and prevent any farther evacuation.

112 2. *Hæmorrhagy from the Rectum*, or *Fluxus Hæmorrhoidalis.*

The diſcharge of blood from the rectum is a diſeaſe chiefly confined to thoſe advanced in life. It is often occaſioned by full living, change from an active to a very ſedentary life, the abuſe of purgatives, particularly aloes; violent paſſions, or habitual melancholy. The ſymptoms which precede and accompany this diſeaſe, are bearing down pains, and a ſenſation of weight in the back and loins, ſometimes a numbneſs in the limbs, and a contracted pulſe, thirſt, diminution of urine, flatulency, and ſometimes a diſcharge by ſtool of a white mucus. The diſcharge returns commonly in a periodical manner once a month, and thus becomes neceſſary for the preſervation of health; for if it be ſuppreſſed, or if it ſtops ſpontaneouſly, it occaſions a variety of nervous affections, ſuch as ſpaſmodic tightnings about the cheſt, colic and vertigo.

Treatment.—When the hæmorrhoidal diſcharge has become habitual like the menſtrual diſcharge, we not only ought not to attempt curing it, but if it be from any cauſe ſuppreſſed, it ought to be reſtored. If it be the effect of general plethora, it is to be removed by a vegetable diet and moderate exerciſe. In order to moderate the diſcharge, the patient ought to lie in the horizontal poſture on a hard bed, avoid all exerciſe, keep the belly open by cooling laxatives, or even to take acids if the bleeding is exceſſive, and apply cold to the loins and perinæum. As a ſudden ſuppreſſion of the hæmorrhoidal diſcharge is the cauſe of many diſeaſes, it is of much importance to reproduce it. To effect this, leeches applied to the anus, and warm fomentations, are the moſt efficacious remedies.

3. *Hæmorrhagy from the Bladder* (Hematuria). 113

Hæmorrhagy from the bladder is a diſeaſe moſt frequent in old people; it is often occaſioned by a ſuppreſſion of the hæmorrhoidal diſcharge, or any other accuſtomed diſcharge of blood. It is ſometimes the conſequence of exceſs in living and drinking, and of a ſedentary life followed by great exerciſe. It alſo ariſes from a plethoric ſtate of the ſyſtem, violent exerciſe on horſeback, the internal uſe of cantharides, a contuſion in the region of the kidneys, or from ſtone in the bladder.

Treatment.—The treatment to be employed is the ſame as in hæmorrhagy in general. Every thing ought to be avoided which might tend to irritate the kidneys or the urinary bladder. Laxatives, acid drinks, the application of ice to the lumbar region, hypogaſtrium, and perinæum, or to the inſide of the thighs, is of great importance. Under the articles MEDICINE and MIDWIFERY, we have conſidered the hæmorrhagies from the lungs and uterus. We may here remark the connection and ſtrong ſympathy which ſubſiſts between theſe organs, and alſo between them and the other organs of the body; for a minute acquaintance with theſe may often lead to a ſucceſsful mode of treating their diſeaſes. When the menſes are ſuppreſſed, there is often a hæmorrhagy from the mucous membrane of the lungs; and there are alſo many caſes of obſtruction in the bowels which bring on hæmorrhagy both from the lungs and uterus; a hæmorrhagy which never ceaſes until the primary affection be removed.

SECT. VIII. *General Remarks on the Ulceration of Mucous Membranes.* 114

Simple inflammation of a mucous ſurface ſeldom, if ever, terminates in ulceration, moſt ulcers of theſe parts having a ſpecific character. The venereal inflammation rapidly terminates in ulceration; and aphthæ have the ſame tendency, forming often what are called phagadenic ſores.

The mucous membrane of the noſe is peculiarly ſubject to ulceration; ulcers alſo occur in the different parts of the mouth and gums, in the inteſtinal canal, and alſo, though very ſeldom, in the urethra. It is the

Of the Diſeaſes of Serous Membranes.

the firſt of theſe only which are to be treated of in this place.

Of Ulcers of the Noſe, or *Ozæna*.

115 This ſpecies of ulcer ſometimes appears in the noſtrils, and ſometimes in the frontal or maxillary ſinus. It generally ſucceeds a violent coryza. It alſo ſometimes ariſes from blows on the noſe, or from the application of very acrid ſubſtances. Ozæna is often accompanied with inflammation, hæmorrhagy, pains, caries of the bones which ſometimes deſtroys the palate bones, cartilages of the noſtrils; and by hindering more or leſs the free paſſage of the air, it alters the tone of the voice.

Treatment.—In the ſimple ozæna, much benefit generally ariſes from the uſe of aſtringent waſhes, ſuch as a decoction of oak-bark and alum, ſolutions of ſulphate or acetate of zinc, or the acetate of lead. The beſt mode of uſing theſe is to inject them a little warmed, with a common ſyringe, into the affected noſtril, three or four times a day; and when the quantity of diſcharge diminiſhes and becomes of a better quality, an ointment compoſed of the flowers of zinc or the like, ſpread on a piece of lint, ſhould be introduced once or twice a day into the noſtril.

When the ozæna is of a more virulent nature, and the bones affected with caries, there is generally great reaſon to ſuſpect a venereal taint. This can only be determined by the hiſtory of the complaint and the conſtitutional ſymptoms of the venereal diſeaſe being preſent. In ſuch caſes mercury is the only remedy, and along with its internal uſe the injection of mercurial lotions, and the uſe of fumigations, will be ſerviceable. In ſuch ulcers as are obſtinate, and which do not partake of any venereal taint, a liniment, with an eighth part of the red precipitate of mercury, or a ſmaller proportion of the acetate of copper, has been recommended by Mr Bell as a uſeful application. In ſome caſes, too, where, after the venereal taint is deſtroyed by a proper mercurial courſe, there remains an obſtinate ſore, the above liniment may be uſeful, and it has alſo been found in ſuch caſes of much advantage, a courſe of ſarſaparilla or cinchona.

Chap. IV.

116 Of the Diſeaſes of Serous Membranes.

General Remarks on the Pathology of Serous Membranes.

The phenomena of the diſeaſes of ſerous membranes are very different from any of thoſe of the other textures which have been mentioned. When they are attacked with inflammation, the ſerous ſurfaces often adhere together, or if ſuppuration takes place, it is never accompanied with ulceration or eroſion of their ſubſtance. However abundant theſe purulent collections may be, the membranes always remain ſound, with only a little additional thickneſs; the purulent fluid rejected from them, being like the natural fluid formed by exhalation.

The ſerous cavities are alſo ſubject to hæmorrhagy, and to preternatural collections of the exhaled fluid.

Under the article Medicine we have treated of inflammation of the pleura, membranes of the brain and peritoneum, and alſo of hæmorrhagy from theſe organs. In this place we ſhall conſider dropſy and hæmorrhagy from the vaginal coat of the teſtes, as the only diſeaſes belonging to ſurgery.

Of Aſcites.

Sect. I. *Dropſy of the Peritoneum*, or *Aſcites*. 117

When water collects in a conſiderable quantity within the cavity of the peritoneum, the ſkin becomes dry and ſcurfy, and the ſuperficial veins varicoſe. In one caſe they appeared like large tubes half filled with blood, the anterior part of the canal thin and dry, and the poſterior portion hard and unyielding. The ſkin at the umbilicus is ſometimes much diſtended, and the water ſeen ſhining through it as in a common bliſter. The water varies much in its appearance; moſt frequently it is yellow or brownifh. We have ſeen it as thick and dark coloured as coffee grounds. In one caſe it was viſcid and tenacious, reſembling the white of an egg; and in other inſtances it reſembled milk and water, with the milk partly curdled. Aſcites is generally accompanied with a diſeaſe of ſome of the abdominal viſcera, and moſt frequently the liver.

It is not confined to any particular period of life, but has been obſerved more frequently in men than in women.

The ſymptoms of aſcites are, 1. The ſwelling and ſenſe of tightneſs over the belly. 2. Laborious and difficult breathing, eſpecially in the horizontal poſture. 3. The diſtinct feeling of fluctuation, upon applying one hand to one ſide of the belly, and ſtriking it with the other hand on the oppoſite ſide. 4. The urine is in ſmall quantity, and of a dark red colour. There is alſo thirſt, a dry ſkin, often a feeling of heat, and very frequently œdema of the inferior extremities. 118

Operation.

Paracenteſis.—When the ſwelling becomes large, and internal medicines have no effect in diminiſhing it, it is adviſeable to diſcharge the water by an artificial opening, an operation which ſeldom cures the diſeaſe, but is always attended with temporary relief, and may be repeated as often as the water is found to collect. Smucker has performed it ſeventy times, and protracted the patient's life for many years. The operation is to be performed by introducing a trocar* at the linea alba, as in a hydrocele, about two or three inches below the umbilicus. Many ſurgeons now prefer this place, as it prevents all riſk of wounding the epigaſtric artery, or any other important part. It was formerly the common practice to introduce the inſtrument on the left ſide of the abdomen, half way between the umbilicus and anterior ſuperior ſpinous proceſs of the ileum, in order to avoid the liver and epigaſtric artery. But thoſe who laid down this rule were not aware of the change in the relative ſituation of parts when diſeaſed; and it has ſeveral times happened to Mr Cline and other eminent ſurgeons, in performing the operation at this place, that they have wounded the epigaſtric artery, and the patient has died of hæmorrhage. The diſſection of the abdominal muſcles in patients who have died of dropſy, ſhows how much the *recti* are extended in breadth, and the ſituation of the epigaſtric artery changed.

* See Plate DXIV.

The place for entering the trocar being determined, and marked with ink, the patient ſhould be placed in the horizontal poſture, and in ſuch a ſituation that the water

Of Hydrocele.

water can be run off readily into a veſſel proper to receive it. But as patients are very apt to faint if the water is ſuddenly removed, and no preſſure applied to ſupport the belly as it is emptied, it is neceſſary to make an equal preſſure during, and after the operation. From neglecting this in ſome caſes, dangerous ſymptoms have ariſen, and in one inſtance the patient died three days after the operation from this cauſe.

A piece of flannel as broad as the belly, and divided into ſeveral pieces at each end, and theſe drawn acroſs each other by aſſiſtants, or the bandage *, anſwers for this purpoſe. By either of theſe modes the belly may be gradually compreſſed as the water is let out, and the compreſſion continued for ſeveral days after the operation. Sometimes the water does not come out readily, by a portion of omentum or inteſtine coming in contact with the end of the canula; but the diſcharge may be aſſiſted by introducing within the canula a blunt probe, or a leſs canula within the firſt, having ſmall perforations at the extremity and edges. After all the water is diſcharged, a piece of plaſter ſhould be applied to the wound, and every caution taken to exclude the admiſſion of the external air. The bandage ſhould alſo be kept applied, and it may be worn for ſome time.

* Plate DXIV.

119 SECT. II. *Water collected in the Cavity of the Vaginal Coat*, or *Hydrocele.*

The effuſion of water in the tunica vaginalis frequently accompanies hernia, the ſcrophulous ſchirrus, venereal and other enlargements of the teſticle; but in ſuch caſes, it is merely to be conſidered as a ſymptom accompanying theſe diſorders. Mr Home mentions caſes where it was a ſymptom of ſtricture. It occurs alſo during the abatement of inflammation of the teſticle; and ſometimes more or leſs of the water remains after the inflammatory ſymptoms have diſappeared. In caſes of this kind the tunica vaginalis is generally found thickened, and there is an effuſion of lymph over its ſurface and over the ſurface of the albuginea. In many caſes, the water is collected where there is no apparent alteration in the ſtructure of the parts. The diſeaſe in ſuch caſes moſt probably ariſes either from a diminiſhed abſorption or from an increaſed exhalation. If the diſeaſe has been of long duration, the tunica vaginalis is generally thickened, to a great degree ſometimes; and particularly in old people it becomes hard or cartilaginous. We have ſeen ſeveral preparations where it was converted into a ſhell of bone. We have met with two caſes where a round ſubſtance reſembling cartilage was found floating looſe in the water of a hydrocele. It is not uncommon to find the veſſels alſo of the ſpermatic veins become more or leſs varicoſe. Collections of water of a very conſiderable ſize form ſometimes after birth (*wind rupture*); but in old people they are moſt frequent. The water is uſually collected only in one cavity; but it ſometimes happens, that in conſequence of adheſions between the tunica vaginalis and teſticle, ſeveral irregular ſhaped bags are formed in which it is contained. The water uſually collects in one ſide of the ſcrotum, ſometimes alſo in both. The water is generally clear and ſtraw-coloured, ſometimes it is coloured with blood, ſometimes yellow or brown, and ſometimes thick, and like coffee grounds. See Morgagni, Ep. xxxviii.

The quantity of water varies. In the Act. Erud. Lipſienſis 1725. p. 492, there is mention made of a caſe which contained forty pounds of fluid. Doight ſaw one which contained four pounds. There are ſometimes alſo hydatids found along with the water. Richter has met with four caſes of this kind.

Symptoms.—1. The ſcrotum is commonly of a pyramidal form, and the corrugations of the external ſkin are deſtroyed in proportion to the bulk of the ſwelling. The ſhape of the tumor, however varies; in ſome caſes, it is very globular, and in others it appears like two ſwellings joined. It is even altered from the manner in which it is ſuſpended; if a bag truſs has been worn it is uſually oblong. 2. The ſwelling generally begins at the lower part of the ſcrotum, and as its bulk increaſes, it gradually aſcends towards the abdominal ring. 3. It appears pellucid when held between the eye and a candle; but this is not a certain prognoſtic, as the tranſparency is deſtroyed when the tunica vaginalis is thick and hard, or when the water is turbid and dark. 4. It gives the diſtinct ſenſation of fluctuation. In ſome caſes, however, the degree of thickening of the tunica vaginalis renders the fluctuation obſcure or imperceptible, and alſo deſtroys its tranſparency. 5. The tumor cannot be made to recede or change its ſituation from preſſure or change of poſture of the body. 6. The teſticle is involved in the ſwelling, and can be diſtinguiſhed like a firm unyielding maſs at the poſterior part of it. In caſes where adheſions have been formed, the poſition varies; but the patient generally knows where it lies, and preſſure applied to the part of the ſwelling where it is ſituated gives pain. Sometimes the teſticle is placed at the under part of the ſwelling, ſometimes in the middle. Mr. Bell felt it twice forwards. Sometimes along with the water there are hydatids floating in the cavity of the vaginal coat. Sommering ſays, that he has often obſerved this appearance. 7. The ſpermatic cord can be readily diſtinguiſhed unaltered. 8. The tumor gives little or no pain, and the patient ſuffers merely from its bulk. 9. The growth of the ſwelling is generally very ſlow, and ſometimes years elapſe before it becomes a great inconvenience; ſometimes, however, it forms rapidly. When it grows very large, the integuments become thick, and the veins varicoſe; if the ſwelling extends up to the inguinal ring, the cord cannot be felt, and the penis is ſometimes ſo much involved in the tumor, that it appears like an umbilicus or piece of corrugated ſkin. 120

Treatment.—In children, the water generally diſappears in a ſhort time, by the application of ſtrong aſtringent or diſcutient applications. In ſome caſes, the diſeaſe advances ſo ſlowly, that it is ſufficient to wear a ſuſpenſory bandage. Richter mentions a caſe where it was twenty years old before it was neceſſary to remove the water. When the ſwelling becomes ſo large as to render it neceſſary to diſcharge the water, the operation may be either *palliative* or *radical.* The object of the firſt is merely to remove the water, after which the diſeaſe commonly returns; and by the ſecond, an adheſion is intended to be produced between the ſurface of the vaginal coat and albuginea, and conſequently the cavity in which the water was collected entirely obliterated. In making choice of theſe modes of treatment, 121

it

Of Hydrocele.

it is neceſſary to attend to the following rules. 1. When the hydrocele is large, it is ſafer to perform the palliative operation; and afterwards when it has again collected in leſs bulk, the radical one may be employed. 2. When the ſtate of the teſticle is not accurately aſcertained, it is better firſt merely to diſcharge the water, which allows it to be completely examined. 3. The palliative operation ſhould be employed in all caſes where the diſeaſe is connected with a morbid ſtate of any contiguous organ. 4. In all other caſes, the radical operation is preferable.

122 *Palliative Operation.*—The matter may be diſcharged either by a puncture made with a lancet or by a ſmall trocar.

* See Plate DXIV.

When the trocar * is to be introduced, the poſterior part of the tumor ſhould be firmly graſped in the left hand, ſo that the fluid is puſhed to the anterior and inferior part of it. A puncture is to be made, with a lancet, through the integuments at the moſt prominent part of the ſwelling, large enough to admit readily the trocar, taking care to avoid any large ſuperficial vein. The trocar is then to be puſhed through the coats of the tumor perpendicularly; but when it has entered the cavity, which is known by the feeling of a ſudden want of reſiſtance, the point ſhould be directed upward, and carried forward a ſufficient way; ſo that the ſurgeon is aſſured of its being within the cavity ſo far that there is no riſk of its falling out.

After all the matter has been allowed to flow out, and the canula withdrawn, the wound ſhould be covered with a piece of ſticking plaſter, and the ſcrotum ſupported by a ſuſpenſory bandage. If the operation is to be done with a lancet, an inciſion ſhould be firſt made through the ſkin, rather larger than what is neceſſary into the cavity. Then a puncture is to be made through the tunica vaginalis, which will allow the water to flow out; and the diſcharge may be aſſiſted by the introduction of a probe, director, or hollow tube, into the opening. The trocar ſhould always be employed for this operation, except when the hydrocele is ſo ſmall that the teſticle would be in danger of being wounded by it, or when there is any enlargement of the teſticle accompanying the hydrocele, which is not well underſtood, or if the tunica vaginalis is extremely thick and the fluctuation not diſtinct.

123 *Radical Operation.*—An obliteration of the tunica vaginalis may be produced either by an effuſion of *lymph* on the ſurfaces of the tunica vaginalis and albuginea, or by the proceſs of *granulation.* The firſt is effected by injecting into the cavity a ſtimulating fluid to produce inflammation and adheſion; the ſecond is by laying open the cavity to produce inflammation and ſuppuration, and to allow it to fill by granulation.

124 *By Injection.*—Dr Monro *primus* firſt propoſed and adopted this ingenious, yet ſimple mode of cure; and it is now that which is moſt generally practiſed in all caſes not attended with any peculiarity or puzzling ſymptom. The fluid contained in the tunica vaginalis, is to be diſcharged by a trocar, in the manner recommended in the *palliative* treatment. The trocar for this purpoſe ſhould be of a rounded form, which is either altogether cylindrical, or only a ſmall ſlit at its extremity; for that of *Andrè*, which is flat and ſlit up at both ſides, is apt to allow the fluid to be effuſed into the cellular membrane of the ſcrotum; an accident which we have ſeen repeatedly happen, and always fruſtrates the object of the operation.

The fluid is then to be injected through the canula either by a ſyringe (Plate DXIV.), which has a moveable *ſtop-cock*, that it may be filled as frequently as is neceſſary, or by an elaſtic bottle, which has a valve in its pipe, ſo as to allow the fluid to paſs forward, but to prevent its exit. It is not neceſſary to inject as much fluid, as there was water in the hydrocele; it anſwers well to fill the cavity moderately and by gentle ſtrokes on the ſcrotum agitate it over the whole ſurface. The fluid moſt commonly employed is *port wine.* Some recommend it to be diluted, but it is better to uſe it pure, and allow it to remain a longer or ſhorter time according to the degree of pain it excites, and the general irritability of the patient. In hoſpitals, other fluids are uſed, as being leſs expenſive. Mr Cline of St Thomas's hoſpital employs a ſolution of the ſulphate of zinc ℥i. ad lbi. From five minutes to a quarter of an hour is in moſt caſes a ſufficient length of time to allow the wine to remain. If it excite ſevere pain in the teſticle or cord, it may be detained more or leſs time. A conſiderable degree of uneaſineſs is always to be wiſhed for in order to ſecure ſucceſs in the operation. After the wine is withdrawn, the wound ſhould be covered with a piece of ſticking plaſter or caddis; the ſcrotum well ſupported with either pillows or a truſs, and the patient put to bed. The operation excites more or leſs ſwelling in a longer or ſhorter period. The medium effect on the teſticle is to cauſe it to ſwell about the bulk of a turkey's egg in four or five days; and the ſurgeon ſhould, by purſuing the antiphlogiſtic regimen, moderate as far as in his power the inflammatory ſymptoms to that pitch, and by an oppoſite treatment bring them up to that degree ſhould they be too mild. Low diet, local or even general blood-letting, purging, the horizontal poſture and fomentations, are the moſt powerful means to arreſt inflammation; but if the patient has little pain, he ſhould live on a nouriſhing diet, and ſome local ſtimulant may be applied over the ſcrotum until a ſufficient degree of inflammation comes on. If the inflammatory ſymptoms abate, the ſwelling diſappears; and it is adviſable to wear always afterwards a bag truſs to ſupport the whole ſcrotum. In ſome caſes the water again collects, and then the operation ſhould be repeated; but it requires caution, as the relative ſituation of parts is ſometimes altered from ſome partial adheſions having formed between the tunics.

We have ſeen frequently caſes where it was thought that the water has been regenerated a few days after the operation, which ſwelling afterwards diſappeared. This probably ariſes from an effuſion in the cellular membrane, but it requires no particular treatment.

125 *By Inciſion.*—After graſping the tumor firmly, an inciſion is to be made through the ſkin with a ſcalpel, from its ſuperior to its inferior part. A puncture is to be made towards the upper part, with a lancet, large enough to admit the point of the fore finger; the fluid is allowed gradually to eſcape through the opening; and the tunica vaginalis is to be laid open its whole extent with a probe-pointed biſtoury in the ſame direction as the inciſion through the integuments. Pledgets of lint dipped in oil,

Of Hydrocele.

oil, or covered with ſimple ointment, are to be put between the lips of the wound, down to the bottom of the cavity, one on each ſide of the teſticle; and the edges of the ſcrotum are to be brought together either by ſtraps or ſuture. A ſingle ligature put through the integuments oppoſite the teſticle, anſwers beſt, and prevents the teſticle from being puſhed without the edges of the wound in conſequence of the degree of ſwelling the operation occaſions. The whole ſhould be covered with a pledget of ointment, and ſuſpended in a tight bandage.

In three or four days after the operation, the external dreſſings ſhould be removed; and in one or two days more, the pledgets interpoſed between the tunica vaginalis and teſticle may be taken away and renewed. The ligature ſhould be cut out whenever the ſwelling of the parts begins to abate, or at any time when it appears to create irritation. During the cure, great care ſhould be taken, firſt, by the introduction of ſlips of plaſter, to prevent the union but from the bottom; ſecondly, to guard againſt the collection of matter in any cavity; thirdly, to prevent the lips of the wound ſeparating far, thus expoſing the teſticle and protracting the cure; and fourthly, to lay open freely any ſinuſes which may form. The cure goes on much more rapidly by perſevering in the horizontal poſture, and keeping the ſcrotum well ſupported. The bowels ſhould be always kept open and regular, and when ſuppuration has begun, the patient's ſtrength ſhould be ſupported by a nouriſhing diet and bark or port wine, if neceſſary. The cure takes from three to eight weeks in moſt caſes. This mode of operating, is the moſt eligible when there is any ambiguity in the caſe, as it allows the teſticles to be accurately examined, and caſtration performed if neceſſary. It ought alſo to be performed when the tunica vaginalis is much thickened and hardened, and it is ſometimes neceſſary, even to cut away ſome of the hardeſt portions. The mode of curing hydrocele by a *ſeton*, *cauſtic*, &c. are now generally given up.

126 When to be adopted.

Sect. III. *Dropſy of the Thorax*, or *Hydrothorax*.

127

The fluid is ſometimes confined to one, and ſometimes affects both ſides of the cheſt. It is commonly of a brown or yellow colour; ſometimes it is reddiſh from a mixture of blood. Its chemical qualities are thoſe of ſerum. When it is accumulated in a large quantity, the lungs are more or leſs compreſſed. Dr Baillie has ſeen a lung not larger than the cloſed fiſt. It is alſo in ſome inſtances accompanied with adheſions between the ſurface of the lungs and pleura.

The exiſtence of water is known by the following ſymptoms. Reſpiration is ſhort and difficult; and the patient cannot reſt in bed, except the head and trunk be elevated from the horizontal poſture. The ſleep is often interrupted by alarms and diſagreeable dreams, and the patient ſuddenly ſtarts from it with a ſenſe of ſuffocation: he is unable to ſtoop much forward, or raiſe any thing from the ground. There is ſometimes a teaſing cough, with little expectoration. During the progreſs of the diſeaſe, the pulſe is very variable; but it is generally irregular. The countenance is pale, and the lips and cheeks of a purple hue. The urine is diminiſhed in quantity, and of a high colour. The bowels are generally conſtipated. The feet and legs are commonly anaſarcous. The undulation of a fluid may be heard by the patient himſelf, and moving the body by ſudden jerks will ſometimes aſſiſt in diſcovering the diſeaſe. The affected ſide has in ſome caſes been obſerved to be enlarged.

Of Hæmatocele.

This diſeaſe is treated by the exhibition of internal medicines, where the quantity of water is ſmall; but when it collects in ſuch a quantity as to threaten ſuffocation, it ought to be diſcharged by an opening made into the cavity of the thorax. The inciſion ought to be made between the fifth and ſixth ribs, half way between the ſternum and ſpine; two inches in length through the ſkin. The ſubjacent parts ought to be cautiouſly divided; and the inciſion ſhould be directed rather towards the upper part of the ſixth rib, to avoid wounding the intercoſtal artery and nerve, which creep along the inferior edge of the fifth rib. The pleura, which is diſtinguiſhed by its bluiſh colour, ſhould be carefully cut with the point of the knife; ſo that, in caſe of adheſion, the lung is not wounded: and if the water flows out, a canula ſhould be introduced into the opening. If it does not, in conſequence of adheſion, another inciſion muſt be made. Great care ſhould be taken to prevent the admiſſion of air, and for that purpoſe, the opening ſhould be made valvular, by pulling up the ſkin which is to be cut through. If the quantity is very great, it may be drawn off at two different intervals; or if it is collected in both cavities of the thorax.

Sect. IV. *Dropſy of the Pericardium.*

128

Water is ſometimes found in the *pericardium* when there is none in any other cavity of the thorax, but it is generally accompanied with a collection of water in ſome of them. The ſymptoms of this diſeaſe are nearly ſimilar to thoſe of hydrothorax; and we find that Deſſault and other very eminent ſurgeons have not been able to diſtinguiſh them. Dr Baillie ſays, "that the feeling of oppreſſion is more accurately confined to the ſituation of the heart; and the heart is more diſturbed in its functions in dropſy of the pericardium than in hydrothorax." It is alſo ſaid, that a firm undulatory motion can be felt at every ſtroke of the heart.

If the exiſtence of this complaint is aſcertained, and if the quantity of water is ſuſpected to be great, it may be perhaps adviſable to diſcharge it, as practiſed in one caſe by Deſſault, by making an opening between the ſixth and ſeventh ribs of the left ſide, oppoſite to the apex of the heart.

Sect. V. *Blood effuſed in the Tunica Vaginalis.* (Hæmatocele).

129

The effuſion of blood within the cavity of the vaginal coat is characteriſed by the ſudden appearance of the tumor, by its wanting the tranſparency of a hydrocele, by its greater weight, and by its being moſt commonly occaſioned by ſome accident. It is uſually produced by the trocar uſed in performing the *palliative* operation wounding a veſſel which pours its blood into the vaginal cavity; it is ſtill more apt to happen when a lancet is uſed and a varicoſe veſſel punctured. It alſo takes place from the rupture of a varicoſe veſſel by the ſudden depletion of a large hydrocele.

If the ſwelling is ſmall, it may diſappear by the local uſe

Of Ganglions.

use of discutients and stimulants, such as solutions of saccharum saturni, or that of alum, vinegar, &c. If it does not yield to these, and if it has acquired a considerable bulk, the blood should be discharged by an incision; and any bleeding vessel either secured by a ligature, or by strong stimulants, and the wound afterwards treated as in common hydrocele.

Chap. V.

Diseases of the Sinovial Membranes.

130 Sect. I. *General Observations on the Pathology of Sinovial Membranes.*

The diseases of the sinovial membranes are much more limited and less understood than those of the textures which we have examined. They do not appear to be sympathetically affected in the diseases of other parts. In the acute diseases of the important viscera, the skin, the mucous surfaces, the cellular membrane, the nerves, &c. are more or less sympathetically affected, whilst all the sinovial membranes remain undisturbed. In this respect they resemble the bones, cartilages, and fibrous membranes. Neither is the sinovial fluid subject to the different alterations, which we observe of the serous fluid. We never find any preternatural membranes formed on the articulating surfaces; and the preternatural collections of sinovia never contain any of the white floculent matter so frequent in serous collections.

The sinovial membranes are subject to inflammation, and are probably the seat of many of those pains about the joints which are so frequent. Their fluids are also sometimes increased to a preternatural quantity, and chalky or earthy depositions are also occasionally found in them.

131 Sect. II. *Of Ganglions.*

An increase of the sinovial fluid in the bursæ, or tendinous sheaths, forms a species of dropsy called a *ganglion*. It is not, however, probable that these tumors are always formed in a natural sinovial capsule: most commonly they are accidental, and are formed in the cellular membrane; for they are frequently found in parts where no natural capsule exists. They are most frequently met with over the tendons upon the back of the wrist, and often likewise about those of the ankle and other parts of the extremities. When pressed, they are found to possess a considerable degree of elasticity, from which, and from their situation, they may generally be distinguished from other encysted tumors. They seldom arrive at any great bulk, are not often attended with pain, and commonly the skin retains its natural appearance. On being laid open, they are found to contain a tough, viscid, transparent fluid, resembling the glaire of egg, which is also sometimes of a reddish colour.

They are generally produced by sprains or contusions of the joints, or by rheumatism. In many instances, they go off insensibly, without any assistance from art; but as this is often not the case, means ought to be used for removing them. For this purpose, friction frequently repeated, or gentle compression applied to them by means of thin plates of lead and bandages, sometimes remove them. In some instances they have been removed by the application of blisters; but the most certain method is, to make a small puncture into the sac, or to draw a cord through it; or, after the puncture is made, to press out the contents, and then inject some gently stimulating fluid, as port wine and water heated blood-warm.

Of Collections in the Joints.

Sect. III. *Of Collections within the Capsular Ligaments of the Joints.* 132

Collections here may consist of serum, blood, or pus and synovia combined. They are most frequently met with in the joint of the knee, and may be produced either by internal or external causes. These kinds of collections may in general be distinguished from each other.

Watery effusions, commonly called *dropsical* swellings of the joints, arise chiefly in consequence of severe rheumatic complaints; and when the tumor is not very large, the fluctuation of the fluid may be felt by pressure. When a large effusion appears immediately after a violent bruise, it is probable that it consists chiefly of blood: but when it succeeds a violent sprain, attended with great pain, inflammation, and swelling, terminating in an effusion, there is every reason to think that the contained fluid consists of pus mixed with synovia.

Swellings of the joints are most apt to be confounded with collections in the bursæ mucosæ, or with matter effused in the adjacent cellular substance. From the first of these they are generally distinguished by the contained fluid passing readily from one side of the joint to the other, and from its being diffused over the whole of it; whereas, when it is contained in the bursæ, the tumor is confined to a particular part, and is seldom attended with much pain.

When such collections can safely be allowed to remain, the capsular ligament ought never to be opened, as they can often be removed by discutients. Even considerable collections arising from rheumatism may commonly be discussed by friction, fomenting the parts with warm vapour, keeping them constantly moist with saturnine solutions, covering them properly with flannel, and applying blisters. When these fail, supporting the part with a laced stocking, or with a roller, has frequently been of service. But whether a rheumatic tumor can be discussed or not, it ought not to be opened; for the inconvenience attending it is more tolerable than the pain and inflammation which may ensue. But when the matter would do mischief by lodging, it should be discharged. Effused blood and matter which succeed high degrees of inflammation are of this kind. Blood is frequently extravasated among soft parts without much detriment; but when in contact with cartilage or bone, it soon injures them. The matter ought to be discharged so as most effectually to prevent the admission of air into the cavity of the joint. For this purpose the opening should be made with a trocar; and the skin, previously drawn tight to the upper part of the tumor, should be pulled down immediately on withdrawing the canula. A piece of adhesive plaster should be immediately laid over the opening, and the whole joint should be firmly supported by a flannel roller carefully applied. If the patient be plethoric, he should be blooded to such an extent as his strength will bear; he should

ſhould be put upon a ſtrict antiphlogiſtic regimen, and in every reſpect ſhould be managed with caution; for inflammation being very apt to enſue, we cannot too much guard againſt it.

133 SECT. IV. *Of Moveable Bodies which are found within the Sinovial Capſules.*

Moveable bodies have been found in many of the ſinovial capſules of the human body. But they are moſt frequent in the knee joint; and it is there only where they require ſurgical aſſiſtance. Theſe bodies are generally compoſed of cartilage in the form of lamellæ, and there is often an oſſeous concretion in their centre. The cauſe of their formation is not known; but it is probable that they are formed by a gradual depoſition of the cartilaginous matter on the articulating ſurface. They have been often met with, attached by narrow necks to the ſinovial cavity; ſo that when this attachment is deſtroyed, they float looſe in the cavity, and undergo perhaps but little future change.

When they occur in the knee joint, and acquire ſuch a bulk as to obſtruct or derange the motions of the joint, it then becomes neceſſary to remove them. This ought to be done by bringing the moveable body to the outer part of the joint, and making a valvular inciſion of ſuch a ſize as admit of its extraction. Sometimes much inflammation ſucceeds this operation, which ought to make us careful in choofing a proper time for performing it, and in uſing every endeavour to repreſs any inflammatory ſymptoms afterwards.

SECT. V. *Of the Spina Bifida.*

134 Spina bifida is a tumor which ſometimes appears upon the lower part of the ſpine in new-born children. A fluctuation is diſtinctly perceived in it, and the fluid it contains can in ſome meaſure be preſſed in at an opening between the vertebræ. In ſome caſes this opening is owing to a natural deficiency of bone; in others, to the ſeparation of the ſpinous proceſſes of the vertebræ.

The diſeaſe proceeds from a ſerous looking fluid collected within the coverings of the ſpinal marrow. It is always fatal. Children labouring under it have been known to live for two or three years; but, in general, they linger and die in a few weeks. All that art has been able to do is to ſupport the tumor by gentle preſſure with a proper bandage. When a tumor of this kind is laid open or burſts, the child generally dies in a few hours. A tumor nearly of the ſame nature with this is ſometimes met with upon different parts of the head in new-born children: it is formed by a fluid lodged beneath the membranes of the brain, which have been forced out at ſome unoſſified part of the ſkull. What we have ſaid with reſpect to the former is exactly applicable to this diſeaſe.

CHAP. VI.

Of the Diſeaſes of the BONES.

135 SECT. I. *General Remarks on the Pathology of the Bones.*

THE diſeaſes of bones are remarkable for their ſlow progreſs, in compariſon with what is obſerved in the other organs. Inflammation proceeds extremely ſlowly, and callus is remarkable when compared with the cicatrization of other parts, for the length of time neceſſary for its formation; the origin and progreſs too of an exoſtoſis is very different from a tumor of the ſoft parts, as we obſerve in phlegmon. Suppuration too, which requires only a few days in other organs, takes months before the ſame proceſs is completed in bones. There is alſo a ſtriking difference between a gangrene of the ſoft parts and a caries or necroſis of the bones. In the natural ſtate the bones have no ſenſibility, but when diſeaſed, they are often the ſeat of acute pain; we obſerve this in the *ſpina ventoſa*, in caries, necroſis, &c. Beſides the changes to which the bones are ſubject from inflammation and various accidents, they alſo ſuffer alterations in their hardneſs and ſoftneſs. Preternatural growths alſo form upon them; and they are liable to abſorption.

SECT. II. *Of Particular Diſeaſes of the Bones.* 136

The bones, as well as the ſofter parts, are liable to be ſwelled, either throughout their whole length, or to have tumors formed on particular parts of them.

137 Exoſtoſis. Exoſtoſis is one ſpecies of tumor of the bone. According to Mr Bromefield, no ſwelling ſhould be called ſo, but an excreſcence continued from a bone, like a branch from the trunk of a tree. Under this head therefore is ranked the *benign node*, which may be produced by external injury, ſuch as contuſions and fractures: it can hardly be called a diſeaſe, as pain ſeldom ſucceeds, but rather a deformity.

138 Tophus. There are riſings or tumors obſervable on the bones which are often the conſequents of venereal virus, and are termed *tophi*, *gummi*, or *nodes*.—Tophus is a ſoft tumor in the bone; and ſeems to be formed of a chalky ſubſtance, that is intermediate between the oſſeous fibres. Theſe cretaceous extravaſations are ſometimes found on the ligaments and tendons, as well as on the bone; and may ſometimes be taken out by the knife. We have many inſtances where chalk ſtones in gouty people make their way out through the ſkin of the fingers and toes.

139 Gummi. Gummi is a ſoft tumor on the ſurface of the bone, between it and the perioſteum; and its contents reſemble gum ſoftened, from whence it has taken its name.

140 Venereal node. The confirmed venereal node has the appearance of a divarication of the oſſeous fibres. When the perioſteum is thickened, but the bone not affected, a courſe of mercury will often produce a perfect cure: but when the bone itſelf is diſeaſed, this method will often fail. But here the diviſion of the extended perioſteum has been known to give perfect eaſe.

The uſual method, formerly, was to apply a cauſtic equal to the extent of the node, which being laid bare, required exfoliation before it could be cicatrized. If the inciſion is made early, that is, before matter be formed under the inveſting membrane, it ſeldom requires exfoliation; and, as we often find that the bone itſelf is not affected, but only the perioſteum thickened, we may be deceived even after a careful examination: it is therefore proper that the patient ſhould be pretty far advanced in a courſe of mercurial unction before even the inciſion is made; for, ſhould the tumor decreaſe, and the pain abate during the courſe, chirurgical aſſiſtance, with the knife, moſt likely may become unneceſſary.

Of the Diſeaſes of the Bones.

141 Carus.

A bone may become carious firſt in its internal parts; and that from external injury, as well as from a vitiated ſtate of the animal-fluids. Authors ſeem not to agree as to the technical term for this kind of diſeaſe of the bones; ſome calling it *cancer* or *gangræna oſſis;* others, *ſpina ventoſa*, from the pointed extuberances uſually attendant on this diſorder of the bone; and ſome again, *teredo*, from the appearance of the carious bone, like wood that is worm-eaten.

142 Abſceſs.

It is univerſally allowed, that this diſeaſe takes its riſe from matter being formed either in the diploe, or in the marrow: whenever obſtruction is begun in the veſſels expanded on, or terminating in, the medullary cyſts, the conſequence will be inflammation, and, if not early removed, matter will form; for this reaſon this caſe may be called *abſceſſus in medulla.* Whenever, then, a patient complains of dull heavy pain, deeply ſituated in the bone, conſequent to a violent blow received on the part ſome time before, though the integuments appear perfectly ſound, and the bone itſelf not in the leaſt injured, we have great reaſon to ſuſpect an abſceſs in the medulla. Children of a bad habit of body, though they have not ſuffered any external injury, will often become lame, and complain of the limb being remarkably heavy; and though not attended with acute pain, yet the dull throbbing uneaſineſs is conſtant. If rigors happen during the time the patient labours under this indiſpoſition, it generally implies that matter will be formed within the ſubſtance of the bone. If the extremities of the diſeaſed bone ſwell, or if it becomes enlarged throughout its whole extent, it may be known to be an abſceſs in the medulla, or the true ſpina ventoſa, as it is called: if neither of theſe ſymptoms take place, the great inſenſibility of the bone in ſome ſubjects will prevent that acuteneſs of pain uſual in other parts where matter is formed, though the acrid matter is eroding the bone during the whole time it is contained within it. This matter at length having made its way through, arrives at the perioſteum, where it creates moſt violent pain. The integuments then become ſwelled and inflamed, and have a ſort of emphyſematous feel. On being examined by preſſure, the tumor will ſometimes be leſſened, from part of the matter retiring into the bone: from this appearance to the touch, moſt likely the name of *ventoſa* was added to the term *ſpina.*

When we are aſſured of matter being under the perioſteum, we cannot be too early in letting it out, as it will ſave a conſiderable deal of pain to the patient, though probably it may not be of any conſiderable advantage in reſpect to the carious bone; for, where the fluids in general are vitiated, no chance of cure can be expected from topical remedies; but where the conſtitution is mended, nature will ſometimes aſtoniſh us in her part, as the carious bone will be thrown off from the epiphyſes, or the teredines will be filled up by the oſſific matter that flows from the parts of the bone where ſome of the ſpinæ have come away.

If proper medicines are given, the children well ſupported, and the parts kept clean and dry, patience and perſeverance will frequently give great credit to the ſurgeon. In caſe it ſhould have been thought adviſable to apply a trephine, to give free diſcharge to the matter, the waſhing it away, as well as the ſmall crumblings of the carious bone, by means of deterſive and drying injections, has been known to contribute greatly to the curing this kind of caries, after the habit of body in general had been mended.

Beſides thoſe above-mentioned, the bones are liable to two oppoſite diſeaſes; the one termed *friabilitas*, the other *mollities;* the former peculiar to adults, the latter more frequent in infants, though ſometimes ſeen in adults, from a vitiated ſtate of their juices.

143 Rickets.

From repeated ſalivations, the bones in old people have been rendered extremely brittle; inſomuch that in many ſubjects they have been fractured merely from their weight and the action of the muſcles: but in ſuch caſes, this is not owing to the friability of the bones, but to the loſs of ſubſtance, from the eroſion of the bone by an acrimonious humour thrown on it: to which cauſe perhaps may be attributed the diſeaſe called *rickets* in children. The effects of ſcorbutic humour in rendering the bones ſoft in many inſtances, have often been remarked.

By proper diet, gentle friction, exerciſe, and cold bathing, rickety children will frequently get their conſtitution ſo much changed, as that, by the time they arrive at the age of 20 years, there ſhall not remain the leaſt veſtige of their former diſeaſe. The epiphyſes are generally moſt affected in this ſpecies of the diſorder. For want of early attention to invalids of this ſort, we find that their bones not only become ſoft, and yield to the powers of the muſcles, but remain diſtorted during the reſt of life, though they have acquired a perfect degree of ſolidity. In ſuch caſes, therefore, the aſſiſtance of a ſkilful mechanic is neceſſary both to ſupport the parts improperly acted on, and to alter the line of direction of the diſtorted oſſeous fibres.

Though the curvature of the extremities, or thickneſs of the ends of the bones near their articulations, may give the firſt alarm to thoſe who are conſtantly with children, yet there are other ſymptoms that give earlier notice; which if they had been timely diſcovered, it is highly probable that the curvature of the limbs in many children might not have happened. The belly generally becomes larger in this diſeaſe, from the increaſed ſize of the contained bowels; the head then becomes enlarged; then a difficulty of breathing ſucceeds, which is generally ſuppoſed to be the effects of taking cold. The ſternum is elevated and ſharp, and the thorax becomes contracted; the ſpine is protruded in ſeveral parts; the pelvis altered, according to the preſſure of the parts within, and habitual inclination of the patient to obtain that line of direction in which the perpendicular from the centre of gravity may fall within the common baſe of the body, the extremities of the cylindrical bones, and the ends of the ribs next the ſternum, become enlarged; ſoon after this the bones in general become ſoft and flexible, yielding in ſuch directions as the ſtrongeſt muſcles determine.

Where the affection of the meſenteric glands is evident, Mr Bromefield aſſerts, that after a doſe or two of the pulvis baſilicus to empty the inteſtines thoroughly, the purified crude quickſilver is by much the moſt efficacious medicine to remove obſtructions in thoſe glands. When the belly begins to ſoften and ſubſide, the chyle paſſes without interruption, and the child begins to get fleſh; then the cold bath becomes truly ſerviceable, and the decoction or cold infuſion of the Peruvian bark is a proper

Of the Diseases of the Bones.

proper restorative; but the cold bath used too early, or the bark given before there is a free circulation of chyle through the lacteals, would be very injurious.

144. Palsy of the lower extremities.

Among the diseases of the bones we may likewise take notice of that *palsy of the lower extremities* which takes place, as is generally supposed, in consequence of a curvature in some parts of the spine. To this distemper both sexes and all ages are liable. When it attacks an infant of only a year or two old or younger, the true cause of it is seldom discovered until some time after the effect has taken place. The child is said to be uncommonly backward in the use of his legs, or it is thought to have received some hurt in the birth. When the child is of an age sufficient to have already walked, and who has been able to walk, the loss of the use of his legs is gradual, though in general not very slow. He at first complains of being very soon tired, is languid, listless, and unwilling to move much or at all briskly. Soon after this he may be observed frequently to trip and stumble, though there be no impediment in his way; and whenever he attempts to move briskly, he finds that his legs involuntarily cross each other, by which he is frequently thrown down without stumbling; and when he endeavours to stand still in an erect posture without support, even for a few minutes, his knees give way and bend forward. As the distemper advances, it will be found that he cannot, without much difficulty and deliberation, direct either of his feet exactly to any one point; and very soon after this, both legs and thighs lose a good deal of their natural sensibility, and become quite useless. In adults, the progress of the disease is much quicker, but the symptoms nearly the same.

Until the curvature of the spine is discovered, the complaint generally passes for a nervous one; but when the state of the back bone is adverted to, recourse is almost always had to some previous violence to account for it. That this might have been the case in some few instances might be admitted; but in by far the greatest number some predisposing cause must be looked for.

Mr Pott, who has written a treatise upon this disease, recommends it to our observation, that though the lower limbs are rendered almost useless, or even entirely so, yet there are some circumstances in which it differs from a common nervous palsy. The legs and thighs, though so much affected, have neither the flabby feel of a truly paralytic limb; nor have they that seeming looseness at the joints, nor the total incapacity of resistance, which allows the latter to be twisted almost in all directions: on the contrary, the joints have frequently a considerable degree of stiffness, particularly the ankles; by which stiffness the feet of children are generally pointed downward, and they are prevented from setting them flat upon the ground.

At first the general health of the patient seems not to be at all, or at least not materially affected; but when the disease has continued for some time, and the curvature is thereby increased, many inconveniences and complaints come on; such as difficulty in respiration, indigestion, pain, and what they call *tightness at the stomach*, obstinate constipations, purgings, involuntary flux of urine and fæces, &c. with the addition of some nervous complaints, which are partly caused by the alterations made in the form of the cavity of the thorax, and partly by impressions made on the abdominal viscera.

Of the Diseases of the Arterial System.

Mr Pott was led to a knowledge of the true cause and cure of this distemper, from observing the case of a youth of 14, who was restored to the use of his limbs immediately after a seemingly accidental abscess near the part. From this he was inclined to think, that the curvature of the spine was not the original cause of the disorder, but that the surrounding parts were predisposed towards it by some affection of the solids and fluids there; and he was confirmed in these suspicions by a variety of appearances, which he observed both in the living body and upon dissection of the subject after death; all of which are narrated at full length in his treatise upon this subject.

"The remedy (says he) for this most dreadful disease consists merely in procuring a large discharge of matter, by suppuration, from underneath the membrana adiposa on each side of the curvature, and in maintaining such discharge until the patient shall have perfectly recovered the use of his legs. To accomplish this purpose, I have made use of different means, such as setons, issues made by incision, and issues made by caustic; and although there be no very material difference, I do upon the whole prefer the last. A seton is a painful and a nasty thing: besides which it frequently wears through the skin before the end for which it was made can be accomplished. Issues made by incision, if they be large enough for the intended purpose, are apt to become inflamed, and to be very troublesome before they come to suppuration; but openings made by caustic are not in general liable to any of these inconveniences, at least not so frequently nor in the same degree: they are neither so troublesome to make or maintain. I make the eschars of an oval form, about two thirds of an inch in diameter on each side the curve, taking care to leave a sufficient portion of skin between them. In a few days, when the eschar begins to loosen and separate, I cut out all the middle, and put into each a large kidney-bean: when the bottoms of the sores are become clean by suppuration, I sprinkle, every third or fourth day, a small quantity of finely powdered cantharides on them, by which the sores are prevented from contracting, the discharge increased, and possibly other benefit obtained. The issues I keep open until the cure is complete; that is, until the patient recovers perfectly the use of his legs, or even for some time longer: and I should think that it would be more prudent to heal only one of them first, keeping the other open for some time; that is, not only until the patient can walk, but until he can walk firmly, briskly, and without the assistance of a stick: until he can stand quite upright, and has recovered all the height which the habit or rather the necessity of stooping, occasioned by the distempers, had made him lose."

Chap. VII.

145

Of the Diseases of the Arterial System.

Sect. I. *General Remarks on the Diseases of the Arterial System.*

The diseases of the vascular system form an important class in systems of Nosology. In the diseases of every organ, the action of the arteries and veins is more or less influenced, though the changes of structure to which these vessels are subject are very limited. The only diseases

Of Aneurisms.

diseases to be considered in a system of surgery, are aneurism and varix.

146

Sect. II. *Of Aneurisms.*

The term *Aneurism* was originally meant to signify a tumor formed by the dilatation of the coats of an artery; but by modern practitioners it applies not only to tumors of this kind, but to such as are formed by blood effused from arteries into the contiguous parts. There are three species generally enumerated; the true or *encysted*, the false or *diffused*, and the *varicose* aneurism.

147 Of the encysted aneurism.

The *true* or *encysted* aneurism, when situated near the surface of the body, produces a tumor at first small and circumscribed; the skin retains its natural appearance: when pressed by the fingers, a pulsation is evidently distinguished; and with very little force the contents of the swelling may be made to disappear; but they immediately return upon removing the pressure. By degrees the swelling increases, and becomes more prominent; the skin turns paler than usual, and in more advanced stages is œdematous: the pulsation still continues; but parts of the tumor become firm from the coagulation of the contained blood, and yield little to pressure; at last the swelling increases in a gradual manner, and is attended with a great degree of pain. The skin turns livid, and has a gangrenous appearance. There is an oozing of bloody serum from the integuments; and, if mortification do not take place, the skin cracks in different parts; and the artery being now deprived of the usual resistance, the blood bursts out with such force as to occasion the almost immediate death of the patient.

When affections of this kind happen in the larger arteries, the soft parts not only yield to a great extent, but even the bones frequently undergo a great degree of derangement.

148 Of the diffused aneurism.

The *false* or *diffused* aneurism consists in a wound or rupture in an artery, producing, by the blood thrown out of it, a swelling in the contiguous parts. It is most frequently produced by a wound made directly into the artery. A tumor, about the size of a horse bean, generally rises at the orifice in the artery soon after the discharge of the blood has been stopped by compression. At first it is soft, has a strong pulsation, and yields a little to pressure, but cannot be made entirely to disappear; for the blood forming the tumor being at rest, begins to coagulate. If not improperly treated by much pressure, it generally remains nearly of the same size for several weeks. The enlargement however proceeds more rapidly in some cases than in others. Instances have occurred of the blood being diffused over the whole arm in the space of a few hours; while, on the contrary, swellings of this kind have been many months, nay even years, in arriving at any considerable size.

As the tumor becomes larger, it does not, like the true aneurism, grow much more prominent, but rather spreads and diffuses itself into the surrounding parts. By degrees it acquires a firm consistence; and the pulsation, which was at first considerable, gradually diminishes, till it is sometimes scarcely perceptible. If the blood at first thrown out proceed from an artery deeply seated, the skin preserves its natural appearance till the disorder is far advanced: but when the blood gets at first into contact with the skin, the parts become instantly livid, indicating the approach of mortification; and a real sphacelus has sometimes been induced. The tumor at first produces little uneasiness; but as it increases in size, the patient complains of severe pain, stiffness, numbness, and immobility of the whole joint; and these symptoms continuing to augment, if the artery be large, and assistance not given, the teguments at last burst, and death ensues.

149 Of the varicose aneurism.

When an artery is punctured through a vein, as in blood-letting at the arm, the blood generally rushes into the yielding cellular substance, and there spreads so as to shut the sides of the vein together. But in some instances where the artery happens to be in contact with the vein, the communication opened has been preserved; and the vein not being sufficiently strong for resisting the impulse of the artery, must consequently be dilated. This is a *varicose aneurism*. Soon after the injury the vein immediately communicating with the artery begins to swell, and enlarge gradually. If there be any considerable communications in the neighbourhood, the veins which form them are also enlarged. The tumor disappears upon pressure, the blood contained in it being chiefly pushed forwards in its course towards the heart; and when the tumor is large, there is a singular tremulous motion, attended with a perpetual hissing noise, as if air was passing into it through a small aperture.

If a ligature be applied upon the limb immediately below the swelling, tight enough to stop the pulse in the under part of the member, the swelling disappears by pressure, but returns immediately upon the pressure being removed. If, after the swelling is removed by pressure, the finger be placed upon the orifice in the artery, the veins remain perfectly flaccid till the pressure is taken off. If the trunk of the artery be compressed above the orifice, so as effectually to stop the circulation, the tremulous motion and hissing noise immediately cease; and if the veins be now emptied by pressure, they remain so till the compression upon the artery be removed. If the vein be compressed a little above, as well as below the tumor, all the blood may generally, though not always, be pushed through the orifice into the artery; from whence it immediately returns on the pressure being discontinued.

When the disease has continued long, and the dilatation of the veins has become considerable, the trunk of the artery above the orifice generally becomes greatly enlarged, while that below becomes proportionably small; of consequence the pulse in the under part of the member is always more feeble than in the sound limb of the opposite side.

150 Diagnosis of aneurism.

Aneurisms have frequently been mistaken for abscesses and other collections of matter, and have been laid open by incision; on which account great attention is sometimes required to make the proper distinction. In the commencement of the disease the pulsation in the tumor is commonly so strong, and other concomitant circumstances so evidently point out the nature of the disorder, that little or no doubt respecting it can ever take place; but in the more advanced stages of the disease, when the swelling has become large and has lost its pulsation, nothing but a minute attention to the previous history of the case can enable the practitioner to form a judgment of its nature.

Aneurisms may be confounded with soft encysted tumors,

Of Aneurisms.

mors, scrophulous swellings, and abscesses situated so near to an artery as to be affected by its pulsation. But one symptom, when connected with strong pulsation, may always lead to a certain determination that the swelling is of the aneurismal kind, viz. the contents of the tumor being made easily to disappear upon pressure, and their returning on the compression being removed. The want of this circumstance, however, ought not to convince us that it is not of that nature; for it frequently happens, especially in the advanced stages of aneurisms, that their contents become so firm that no effect is produced upon them by pressure. Hence the propriety, in doubtful cases, of proceeding as if the disease was clearly of the aneurismal kind.

151 Prognosis. In the prognosis, three circumstances are chiefly to be attended to; the manner in which the disease appears to have been produced, the part of the body in which the swelling is situated, and the age and habit of body of the patient.

If an aneurism has come forward in a gradual manner, without any apparent injury done to the part, and not succeding any violent bodily exertion, there will be reason to suppose that the disease depends upon a general affection either of the trunk in which it occurs, or of the whole arterial system. In such cases art can give little assistance; whereas if the tumor has succeeded an external accident, an operation may be attended with success.

In the varicose aneurism a more favourable prognosis may generally be given than in either of the other two species. It does not proceed so rapidly; when it has arrived at a certain length, it does not afterwards acquire much additional size; and it may be sustained without much inconvenience for a great number of years. As long as there is reason to expect this, the hazard which almost always attends the operation ought to be avoided.

Treatment.—In every case of aneurism, the use of pressure has been indiscriminately recommended, not only in the incipient period of the disease, but even in its more advanced stages. In the diffused or false aneurism, as pressure cannot be applied to the artery alone, without at the same time affecting the refluent veins; and as this, by producing an increased resistance to the arterial pulsations, must force an additional quantity of blood to the orifice in the artery—no advantage is to be expected from it, though it may be productive of mischief. 152 By pressure.

In the early stages of encysted aneurism, while the blood can be yet pressed entirely out of the sac into the artery, it often happens, by the use of a bandage of soft and somewhat elastic materials, properly fitted to the part, that much may be done in preventing the swelling from receiving any degree of increase; and on some occasions, by the continued support thus given to the weakened artery, complete cures have been at last obtained. In all such cases, therefore, particularly in every instance of the varicose aneurism, much advantage may be expected from moderate pressure.

But pressure, even in encysted aneurism, ought never to be carried to any great length; for tight bandages, by producing an immoderate degree of reaction in the containing parts to which they are applied, instead of answering the purpose for which they were intended, have evidently the contrary effect. Indeed the greatest length to which pressure in such cases ought to go, should be to serve as an easy support to the parts affected.

Of late years the subject of aneurism has attracted the notice of several eminent surgeons of this country; and arterial trunks have been successfully tied, which had been often proposed, but never executed. Mr John Bell several years ago, tied the trunk of the gluteal artery. Mr Abernethy of St. Bartholomew's hospital, tied the common femoral. Mr Astley Cooper of Guys, tied the common carotid; and Mr Ramsden of St. Bartholomew's hospital, has lately tied the subclavian artery.

Sect. III. *Of the Popliteal Aneurism.* 153

We are indebted to Mr John Hunter for the ingenious operation for popliteal aneurism. The operation consists in exposing the femoral artery about the middle of the thigh, and putting a ligature round the vessel. An incision is to be made through the integuments, two inches and a half in length on the inner edge of the sartorius muscle (see Plate DXV. fig. 1.). An incision is to be made through the sheath containing the artery with its accompanying vein and nerve, and a double ligature is to be introduced underneath it, by means of a blunt needle; care being taken not to include either the femoral vein, or crural nerve. One ligature is to be tied as high up, and the other as low as the artery is separated from the contiguous parts; the distance between the two being rather more than half an inch. The artery should then be divided by a probe-pointed bistoury, (Plate DXIII.) in the interspace between the two ligatures, but nearer to the lower ligature than to the upper one. The ligature should be moderately thick, in order that the noose may be drawn as tightly as possible, without risk of tearing, or cutting the coats of the vessel. The limb may be kept warm after the operation, by artificial heat if necessary; and the wound treated in the usual manner. * See Plate DXIII.

Sect. IV. *Of the Femoral Aneurism.* 154

The external iliac artery was first tied by Mr Abernethy *; and there are now eight cases on record where the practice has been followed, six of which were successful. Mr Abernethy's operation consists in making an incision through the integuments of the abdomen, about three inches in length in the direction of the artery, beginning just above Poupart's ligament, (see Plate DXV. fig. 1.) and half an inch on the outside of the abdominal ring, in order to avoid the epigastric artery. The aponeurosis of the external oblique muscle is then to be divided in the direction of the wound. The lower margin of the internal oblique and transverse muscles is to be cut with a crooked bistoury. The finger may then be passed between the peritonæum by the side of the psoas muscle, so as to touch the artery. A double ligature is to be put underneath the vessel, and tied as in the operation for popliteal aneurism. * See *Mr Abernethy's Surgical Observations.*

Sect. V. *Of the Carotid Aneurism.* 155

It had been repeatedly proposed to tie the carotid artery; but the operation was first performed by Mr Astley

Of Varicose Veins.

Astley Cooper. There are three instances of this artery having been successfully tied, so that there is sufficient encouragement to adopt the practice in future cases, where there is room to tie the artery above the sternum. The operation is to be done by making an incision on the side of the artery next the trachea, laying bare the vessel, and carefully avoiding the par vagum and the recurrent branch in placing the ligature.

156 SECT. VI. *Of the Axillary Aneurism.*

Mr Keate of St George's Hospital, tied with success the axillary artery, where it passes over the first rib; and Mr Ramsden has lately tied the subclavian artery for an axillary aneurism. The patient however died. A similar operation was attempted by Mr Cooper, but he failed in tying the ligature round the artery, from the bulk of the tumor. The great difficulty felt in these operations was the passing of the ligature below the vessel on account of its depth. Some contrivance is therefore necessary in order to facilitate this part of the operation.

CHAP. VIII.

Of the Diseases of the VENOUS SYSTEM.

157 SECT. I. *Of Varicose Veins.*

WHEN the veins of any organ become preternaturally dilated, they are said to be *varicose*. This state of the veins is most usually met with in those which are superficial, and seems to arise either from some mechanical cause preventing the ready flow of blood through them, or from the veins themselves losing the necessary support of the skin and adjacent parts. The gravid uterus, by pressing on the iliac vessels, frequently renders the veins of the lower extremity varicose. Various tumors produce similar effects. We also see the veins of the integuments of old people become tortuous and swelled from no mechanical pressure.

Varicose veins are a frequent attendant on ulcers of the leg, and it has been observed that the ulcer seldom or ever heals until the varix is cured.

Varicose veins of the extremities may generally be much relieved by the application of a proper bandage from the toes upwards; and in cases where this does not give relief, the venous trunk should be tied with a ligature as directed in aneurism.

158 SECT. II. *Varicose Spermatic Veins* (Variocele).

The veins of the spermatic cord often remain varicose after inflammation of the testicle, and also in early life without any known cause. The disease is generally easily distinguished by the tortuous irregular swelling. It sometimes, however, acquires a large size; but even then its nature may be readily distinguished by placing the patient in a horizontal position, and applying pressure to the tumor. By this the swelling disappears, and if the upper part be grasped so as to allow nothing to pass out of the abdomen, the swelling will nevertheless be again formed.

The disease occurs most frequently in the left side, and this may arise from the vein in that side not terminating directly in the vena cava, but in the emulgent.

Of the Diseases of the Testicle.

Treatment.—The use of astringents, along with a proper suspensory bandage, will generally afford relief. It has also been proposed to tie a ligature round one or more of the varicose vessels. In one case this was done with complete success.

SECT. III. *Of Hæmorrhoidal Tumors.* 159

The hæmorrhoidal tumor consists in a dilatation of the veins about the anus and extremity of the rectum. They are round smooth tumors of a purple colour, and more or less painful. They vary in their size and number. Sometimes they are accompanied by a regular periodical discharge of blood, (bleeding piles) and in other cases no such discharge takes place, (blind piles) and then they are more subject to inflammatory attacks.

Hæmorrhoids occur more frequently in women than in men, and they commonly arise from a long continued pressure on the rectum; as obstinate costiveness, prolapsus, gestation, calculus or tumors about the bladder, uterus, or vagina.

Treatment.—When they are inflamed, local bleeding, fomentations and poultices give much relief, care being taken at the same time to keep the tumors within the anus, and to keep the bowels very open by mild laxatives and clysters.

In some cases the piles acquire a very considerable bulk, and form a number of large and loose tumors round the anus, which prevent the free discharge of fæces. In such cases the tumors ought to be removed, and this may be best done with the knife; or, as sometimes happens, if they be so situated as to render this dangerous, they may be removed by a ligature.

CHAP. IX.

Of the Diseases of the GLANDULAR SYSTEM.

SECT. I. *General Remarks on the Pathology of the Glands.* 160

WE observe a vast variety of diseases of the glandular system, and the greater number of these arise from a morbid state of their secretions. We see striking examples of an increased secretion in diabetes, in the mercurial salivation, and in many bilious disorders: on the other hand the natural secretion is diminished in suppression of urine, in dryness of the mouth, &c.

An alteration in the secretory function is not, however, the only disease of this system; there are a great number of organic alterations of structure with which they are affected, and a variety of tumors are also found to form in them. As, however, most of the principal glands of the body are situated within the larger cavities, few of their diseases come within the province of the surgeon.

SECT. I. *Of the Diseases of the Testicle.*

1. *Of the Schirrus and Cancer of the Testicle*, (Sarcocele). 161

This affection is liable to a considerable variety in its appearances; and as in the description of it which has been given by authors, they have included symptoms of diseases

Of the Diseases of the Testicle.

diseases which are very different from the true schirrus.

The most remarkable symptom of schirrous testicle is a gradual enlargement and induration of the body of the gland or epididimis, advancing from one point, without marks of inflammation or pain. Along with its increase in bulk it acquires additional hardness, and its surface, from being smooth, turns by degrees unequal and knotty. The integuments become of a purplish red, at last ulcerate, discharge a fœtid ichor, and a cancerous fungus grows from the wound. The spermatic chord also becomes enlarged, knotty, and hard, and the glands of the groin swell, the health of the patient becoming entirely destroyed, and at last carrying him off in the greatest misery.

162 Symptoms.

The progress of this disease is in general slow, and is commonly attended with an aching sensation about the testicle, and severe pain darting from it to the loins, particularly when the testicle is not supported. The disease is most frequent in the advanced stages of life. It commonly arises from an unknown cause. It has at times been known to succeed a venereal affection, but this is by no means common, and it is sometimes preceded by a blow or some accident which excites inflammation.

163 Appearances on dissection.

When the schirrous testicle is examined by dissection, Dr Baillie observes that "it is found to be changed into a hard mass of a brownish colour, which is generally more or less intersected by membrane. In this there is no vestige of the natural structure, but cells are frequently observable in it containing a sanious fluid, and sometimes there is a mixture of cartilage." Sometimes water is found collected in the cavity of the tunica vaginalis, but more frequently the tunics adhere to each other. When the spermatic cord is affected, that exhibits the same changes of structure as the testicle itself.

164 *Treatment.*—When a testicle is known to be affected with the true schirrus, all prospect of a cure by the exhibition of internal or external remedies becomes hopeless, as there is no fact better known and more severely felt in the history of schirrus and cancer in every organ of the body, than its resisting all means of relief, but by the complete removal of the diseased part. In a few rare cases, by a moderate diet, keeping the bowels open, suspending the tumor, avoiding violent exercise, or any thing which may prove a source of irritation, the disorder has been said to be not only prevented from increasing, but has in a gradual manner entirely disappeared; but we much suspect that these cases whose termination was so favourable, have not been of a schirrous nature. This is probable from what is known of the termination of schirrus in other organs of the body, and also from the difficulty we have in forming an accurate diagnosis in the diseases of the testicle. There are, we hesitate not to say, many testicles extirpated which might have been saved; for our imperfect knowledge of the various morbid changes of this organ, has made it too much an established practice to extirpate all testicles which are enlarged and hard, and which do not yield to mercury.

When, however, by an attentive examination of the history and symptoms of the disease, no doubt is entertained of its schirrous or cancerous nature, the more speedily the tumor is removed, the better chance there is of a permanent cure. In performing the operation, care should be taken to remove completely every part suspected to be diseased, and no part of the skin should be left with a view of covering the wound more completely which has the least discolouration or mark of disease.

Mode of extirpating the Testicle. 165

The parts being previously shaved, the patient is to be laid upon a firm table covered with a blanket or mattress. His legs should hang over the table, and be supported by assistants. An incision is to be made through the integuments with a common scalpel, extending from a little above the external abdominal ring to the bottom of the scrotum. The cellular membrane around the spermatic chord is to be dissected back, and the chord laid fairly bare; and this part of the operation is much more easily accomplished when the incision through the skin is very free. A ligature of considerable thickness is to be put underneath the chord, and it may be introduced with a blunt pointed needle or instrument (fig. 17. Plate DXIII.). The extent of the disease in the chord should now be examined as accurately as possible, and the ligature should be tied firm with a running knot, as far above the diseased part as possible. If any hardness extends to the external abdominal ring, the chord may be even dissected up along the inguinal canal, and the ligature put on at that place. The chord may be divided one-fourth of an inch below where the ligature has been applied, and then the whole of the testicle and its vaginal coat may be readily dissected away, taking care not to cut into the vaginal cavity of the opposite side of the scrotum. After the testicle is removed, the ligature should be loosened, and the spermatic artery and veins included in separate ligatures. The ligature upon the spermatic chord is to be left loose, so as to act as a tourniquet if a hæmorrhagy should ensue. Much care should also be taken to secure any arteries of the integuments of the scrotum which are seen bleeding; as we once met with a very troublesome hæmorrhagy from one of these retracting among the loose cellular texture, and not being seen after the operation. It therefore will be a good general rule to tie these with ligatures immediately after they are divided.

The wound is to be dressed, so as to be healed if possible by adhesion; and this may generally be accomplished, except at the upper part where the ligatures come through. With this view the wound and scrotum are to be carefully washed, and two or three stitches, as may be thought most expedient, are to be put through the edges of the wound; for in a part like the scrotum, where the skin is loose and puckered, it is hardly possible to apply adhesive straps with sufficient accuracy, so as to serve the purpose. Small pieces of adhesive plaster, however, should be neatly placed between each of the stitches, along the whole extent of the wound, and a pledget of simple ointment and compress afterwards to be laid over it, the whole being secured with a T bandage.

After the operation, the patient is to be put to bed, being directed to lie on his back with a pillow between the thighs, so as to support the scrotum.

Opiates should be given to allay pain, and if any inflammatory symptoms supervene, bleeding at the arm should be had recourse to without the least hesitation; for

Of the Diſeaſes of the Teſticle.

for we have made a general remark, that after almoſt all ſurgical operations, there has ſcarcely ever an inſtance occurred where the patient died from loſs of blood, and on the contrary, that almoſt all patients who have loſt much blood, or who have been previouſly much emaciated, have recovered more quickly than thoſe in full health. The antiphlogiſtic regimen in almoſt every caſe ſhould be rigidly purſued, until at leaſt all inflammatory appearances of the wound are gone, and a healthy ſuppuration commenced. About four, five, or ſix days, according to circumſtances, the dreſſings ſhould be removed, and if the wound has healed by adheſion, the ſtitches may be withdrawn, and the edges of the wound kept together by adheſive plaſters. The ligature on the ſpermatic chord may now be ſafely taken away, and that round the ſpermatic artery and veins generally comes readily away before the tenth dreſſing. In this manner the wound ſhould be dreſſed daily until it is cicatriſed. When the wound, inſtead of healing by adheſion, ſuppurates, the ſtitches may be taken away as ſoon as it appears that the edges of the wound can be accurately kept together with the adheſive plaſters; for if the ſtitches are allowed to remain long, they generally ulcerate the contiguous ſkin, and form ſinuſes, which continue to diſcharge matter after the reſt of the wound has healed. The wound ſhould be dreſſed once or even twice in twenty-four hours if the diſcharge be profuſe, and care ſhould be taken to waſh away with a ſponge any matter which may be depoſited on the ſound ſkin of the ſcrotum or groin. The edges of the wound ſhould be brought accurately together at each dreſſing, any matter collected in different parts of it ſhould be gently ſqueezed out, ſo as to prevent any lodgement from taking place. Should the patient become weak from the continuance of the diſcharge, he ſhould be ordered a nouriſhing diet, with a proper proportion of wine; and if the diſcharge be at any time thin and very profuſe, we have found much benefit in ſuch a caſe from the internal uſe of bark (cinchona).

166 Mode of dreſſing the wound.

2. *Inflammation of the Teſticle* (Hernia humoralis).

167 Symptoms.

Inflammation is one of the moſt frequent diſeaſes of the teſticle. Sometimes the inflammation is confined to the ſubſtance of the teſticle, at other times it affects the epididimis, and in ſome caſes it ſpreads to the albuginea and vaginalis. The ſurface of the inflamed teſticle is uniform and ſmooth, more or leſs ſenſible to the touch, equally firm and tenſe throughout when preſſed upon, and the integuments are generally diſcoloured, having a bluſh of redneſs, and interſperſed with varicoſe veins. When examined by diſſection, the teſticle exhibits, according to Dr Baillie, preciſely the ſame appearances as the inflammation of the ſubſtance of other parts. The vas deferens ſometimes partakes of the inflammation, its coats becoming conſiderably thickened, and in other inſtances the veins of the ſpermatic chord become varicoſe. Inflammation of the teſticle moſt frequently is preceded by gonorrhœa, but it alſo occurs from a variety of cauſes. It occurs ſometimes from expoſure to cold, from violent exercise, and is often excited from blows, riding on horſeback, &c.

The inflammation of the teſticle concomitant of gonorrhœa generally begins by ſpreading along the vas deferens from the proſtate gland through the inguinal canal till it comes to the teſticle; it is in moſt caſes attended with excruciating pain from the rapidity of its progreſs; and as it commonly comes on when the gonorrhœal diſcharge diminiſhes or diſappears, and ſubſides when the diſcharge returns, many authors have ſuppoſed that it was a true metaſtaſis of the venereal matter.

If the diſeaſe be left to itſelf, the body of the teſticle becomes more hard and painful, with all the ſymptoms of local inflammation, and the tumor ſometimes acquires an enormous bulk. Sometimes the inflammation is accompanied with violent fever, with a pulſe hard and ſtrong in the plethoric, and feeble and rapid in conſtitutions which are delicate and irritable. The patient alſo often complains of pains in the loins, and has nauſea and vomiting. In general the diſcharge from the urethra diminiſhes conſiderably, and often it ceaſes altogether before the teſticle becomes affected; but ſometimes that does not happen in any remarkable degree till one or two days after the ſwelling has begun to appear. It never happens that both teſticles are affected at the ſame time, but when the ſwelling of one diſappears, often the other one begins to be attacked.

The teſticles ſometimes ſwell and inflame from the abſorption of the matter of a chancre, and as the progreſs of the ſwelling is in ſuch caſes ſlow, and generally more irregular, it has ſometimes been miſtaken for a ſchirrous teſticle; but an inveſtigation into the hiſtory of the caſe, and particular attention to the appearance of the ſkin of the ſcrotum, and any ſymptoms of the venereal diſeaſe in other parts of the body will generally lead to a knowledge of the true nature of the caſe. It ſometimes happens that inflammation is chiefly confined to the ſpermatic chord, and in many caſes it affects the epididimis alone. The extent of the diſeaſe is always eaſily aſcertained by a careful examination of the parts. It ſeldom happens that both teſticles are inflamed at once; we have, however, remarked this to take place. Inflammation ſuch as has now been deſcribed, generally abates by the application of proper remedies: in ſome caſes, however, an induration of the teſticle remains. It terminates, though rarely, in ſuppuration.

Treatment.—When an inflammation has ariſen from a blow, from expoſure to cold, or from any injury done to the teſticle, it ought to be treated according to the general plan laid down of treating inflammation of other organs. Local bleeding by leeches is a moſt uſeful remedy, and ought to be the firſt thing employed, if there is the ſlighteſt pain, tenderneſs, or redneſs of the ſcrotum. Fomenting the ſcrotum with warm water, or a decoction of poppy heads, chamomile flowers, or tobacco leaves, often give much relief, and great attention ſhould be paid in ſupporting the teſticle with a ſilk net truſs (Plate DXIV.). Some have alſo uſed with ſucceſs the application of ice or ſnow to the part. If the ſymptoms and pain are very violent, bleeding at the arm may be neceſſary. The bowels ſhould be kept open, and even purged; the patient ſhould be confined to a low diet, and he ſhould keep as much as poſſible to the horizontal poſture, as this is found to be of the greateſt importance in promoting the cure. 168

When the inflammation ariſes from gonorrhœa, particular attention muſt be paid not only to the diſeaſe in the teſticle, but to that of the urethra. Indeed it is of much importance in the treatment of gonorrhœa to uſe means

Of the Diſeases of the Teſticle.

means to prevent the teſticles from becoming inflamed; and as every thing which cauſes a ſuppreſſion of the diſcharge tends to produce a ſwelling of the teſticle, it is natural to ſuppoſe, that in order to prevent this troubleſome diſorder, every thing ſhould be avoided capable of increaſing the irritation and inflammation of the urethra, as expoſure to cold, violent exerciſe, ill choſen injections, and balſamic medicines; but above all, the uſe of a ſuſpenſory is moſt efficacious, and Swediaur * recommends one to be worn in every caſe of gonorrhœa from the commencement of the diſeaſe, to prevent all riſk of the teſticles becoming inflamed. When the inflammatory ſymptoms are ſevere, the treatment ſhould be adopted as we have recommended in common inflammation of the teſticle. If the diſcharge from the urethra is ſtopt, means ſhould be uſed to reſtore it. Whenever the inflammatory fever is rendered more mild, Swediaur recommends, with this view, a doſe of opium to be given, and according to circumſtances, an injection compoſed of two or three ounces of oil of linſeed and decoction of barley, along with fifty or ſixty drops of the vinous tincture of opium. This may be repeated every ten or twelve hours, taking care always to have the bowels well opened before uſing it. Swediaur has found the extract of hyoſcyamus in many caſes anſwer better than opium. Fomentating the penis and adjacent parts with warm vinegar and water, injecting warm oil, and the uſe of bougies, may alſo be advantageous in promoting the diſcharge from the urethra.

* *Traité ſur les Maladies Veneriennes.*

169 3. *Induration of the Teſticle.*

After the inflammatory ſymptoms have abated, it generally happens that a degree of ſwelling and hardneſs of the body of the teſticle, but ſtill more frequently of the ſpermatic cord or epididimis, remains, and in many caſes continues for months, or even during life. This effect takes place from whatever cauſe the inflammation may have ariſen. In many caſes the teſticle itſelf remains quite ſound, and the epididimis is converted into a very hard unyielding maſs, which feels as if it were injected with quickſilver. Sometimes the teſticle, whilſt it remains hard, diminiſhes in ſize, and becomes much ſmaller than natural. When the teſticle is examined by diſſection, it is found to have loſt its natural ſtructure, and is ſometimes changed into a hard brown-coloured maſs (Voigtel), interſected more or leſs by membranous bands; ſometimes parts having a cartilaginous quality appear it, and ſometimes cells are formed which contain matter. The ſeminal veſſels are ſo changed and hardened, that they cannot be diſtinguiſhed from each other. In ſome caſes the whole teſticle has been found converted into a cartilaginous maſs, and in a few inſtances ſome parts of it have been converted into bone.

170 Treatment.

The treatment uſually recommended in caſes of induration of the teſticle preceded by inflammation, are ſtrong ſtimulating and aſtringent applications; ſuch as ſolutions of the muriate of ammonia, acetate of lead, ſulphate of zinc, &c. either applied by moiſtening with them a piece of linen, which is to be kept conſtantly wet, or by uſing them in the form of a poultice. Frictions with mercurial ointment, either ſingly or combined with camphor, over the ſcrotum and perinæum, ſometimes produce a good effect; mercurial fumigations to the genital organs have alſo been recommended. In ſome caſes the internal uſe of mercury has been found neceſſary. A mercurial plaſter with camphor, or the common ſoap plaſter, is alſo a good application, and is very uſeful in defending the teſticle.

The internal and external uſe of the hemlock (*conium maculatum*) has been much recommended by Plenk. Electricity has alſo been ſucceſsfully employed. The muriate of lime, and the muriate of barytes, have been uſed by ſome authors. Swediaur ſays that he has known ſome affections of the teſticle produced by gonorrhœa, and alſo ſome diſeaſes of the eye from the ſame cauſe, cured by the patient getting a freſh infection. In a few caſes of induration, and ſwelling of the teſticles, we have employed bliſtering with good effects. The ſcrotum ſhould be ſhaved before this is done; and it is often neceſſary to repeat the bliſter ſeveral times before the hardneſs or ſwelling begin to abate.

4. *Abſceſs of the Teſticle.*

171 Symptoms.

It ſometimes, though rarely happens, that the teſticle ſuppurates. The matter which is formed, is commonly a tough, thready, yellow-coloured ſubſtance, which adheres to the ſurface of the cavity in which it is contained. Sometimes there is only one abſceſs; in other caſes the matter is contained in ſeveral ſmall irregular ſhaped cavities. Sometimes the matter is formed in the very middle of the body of the teſticle; in other caſes we have obſerved ſmall abſceſſes in different parts of the epididimis, the body of the teſticle remaining quite ſound. When an abſceſs is formed in the teſticle, the ſtructure of the gland becomes more or leſs changed; generally inſtead of being ſoft, and the tubes of which it is compoſed being eaſily ſeparated, it degenerates into a hard firm maſs.

172 Treatment.

Abſceſſes of the teſticle ſhould be opened as ſoon as poſſible, in order to prevent the ſubſtance of the teſticle from being deſtroyed. The preſence of matter is learnt by a fluctuation which can be felt externally; but it is often extremely difficult to determine the true ſituation of the abſceſs, whether it is formed in the body of the teſticle, in the epididimis, or between the albuginea and tunica vaginalis, or in the cellular membrane external to the tunica vaginalis; for when ſuch a degree of inflammation has taken place as to terminate in the formation of an abſceſs, the accompanying ſwelling deſtroys the natural form of the parts, and involves the whole into a undetermined ſhapeleſs maſs. Richter remarks, that there are ſometimes ſoft ſpots in the teſticle, in which it is believed there is a fluctuation. When ſuch ſwellings are opened no matter is diſcharged, nothing but blood appears, and the inflammatory ſymptoms are afterwards increaſed. The more matter which is diſcharged from an abſceſs of the teſticle, the ſmaller the teſticle grows, as the matter is ſometimes formed partly of the thready ſubſtance of the teſticle. Caſes have occurred where the whole teſticle has been pulled away, the ſurgeon having miſtaken the ſeminiferous tubes for ſloughs. Abſceſſes of the ſubſtance of the teſticle ſeldom heal, and generally a fiſtulous opening remains, through which there is a conſtant oozing of the ſeminal fluid.

5. *Fiſtulous Sinus of the Teſticle.* 173

As far as we know no author has taken notice of this appearance. In one caſe we obſerved it very remarkable. The epididimis alone was ſwelled, and there was

Of the Diſeaſes of the Teſticle.

a thickened portion of ſcrotum adhering to one part of it, in which there was a ſmall *ſinus*, and through which the ſeminal fluid conſtantly oozed. In a ſimilar caſe the ſinus was laid open, but with no good effect; for a ſmall opening remained unhealed, through which the ſemen continued to be diſcharged.

6. *Scrofulous Teſticle.*

174 Symptoms. When the teſticle is affected with ſcrofula, it preſents ſome of thoſe general characters of ſcrofula in other glandular parts. Its tubular appearance is deſtroyed; it becomes enlarged; and when cut, it is found to be compoſed of a dull white ſubſtance, of the conſiſtence of curd, which in ſome parts is mixed with a thin puriform fluid. The ſcrotum is in almoſt all caſes involved in the diſeaſe; it becomes red and inflamed, and the vaginal coat adheres to the albuginea. Abſceſſes alſo form in various parts of the cellular membrane of the ſcrotum, which ſometimes communicate with the body of the teſticle. This diſeaſe generally occurs during the early periods of life, and moſt commonly only one teſticle is affected with it. Sometimes, however, when one recovers, the ſame diſeaſe attacks the other.

175 Treatment. In moſt caſes of this kind ſurgical aid does not avail much, for the progreſs of the diſeaſe cannot be checked by any internal and external remedies. All that can be done is to relieve the inflammatory ſymptoms, to allay pain, and to prevent the formation of ſinuſes. With a view to alleviate the ſymptoms of inflammation, nothing is ſo beneficial as the application of leeches to the ſcrotum, and the uſe of fomentations and poulticing, or ſolutions of the acetate of lead. Opiates and laxatives may be alſo freely given, unleſs in caſes where from experience theſe are known to diſagree. When matter has once formed, the ſooner it is diſcharged the better, and this ſhould be done by a ſmall inciſion. After one abſceſs has healed, others are very apt to form in ſucceſſion; theſe ſhould be treated in the ſame manner, and if at any period of the diſeaſe ſinuſes form, they ſhould be at once laid completely open to the bottom; or if they are very deep and extenſive, a ſeton may be introduced; if this, however, does not produce an adheſion of the cavity, they ſhould be laid open with a biſtoury in the manner directed when treating of *ſinuſes*.

176 ### 7. *Teſticle preternaturally ſmall, and awanting.*

After violent attacks of inflammation, or in caſes of abſceſs, the teſticle ſometimes diminiſhes greatly in ſize, is almoſt entirely abſorbed; and in a few inſtances people have been born with them much ſmaller than natural (Baillie). Sometimes a teſticle has been known to waſte away without any known cauſe, ſo as to diſappear altogether. Sometimes one teſticle, and ſometimes both remain in the cavity of the abdomen through life; ſo that a perſon appears to have only one teſticle or to be without them altogether. Mr Hunter ſuſpects that in theſe caſes they are not ſo perfect as when they deſcend into the ſcrotum; and if we were to reaſon from what is obſerved in other animals, in the horſe particularly, where this by no means unfrequently takes place, it is highly probable that when the teſticles do not deſcend into the ſcrotum, they are not capable of performing their functions.

Theſe caſes, though they cannot be relieved by medical aid, yet they are worthy of the notice of medical men.

8. *Fungus of the Teſticle.*

Of the Diſeaſes of the Mamma.

There ſometimes ariſes from the teſticle a ſpecies of fungous tumor, which was firſt accurately deſcribed by Mr Lawrence, demonſtrator of anatomy at Bartholomew's hoſpital, in London.

177 Symptoms. The patient generally aſſigns the origin of the complaint to ſome injury. In ſome caſes, it is the conſequence of *hernia humoralis*, and in others it appears ſpontaneouſly. The ſcrotum, after a certain length of time inflames, and adheres to the teſticle already ſwelled; at laſt the ſkin ulcerates, and the opening thus formed, inſtead of diſcharging matter, is filled up with a fungous tumor, which is of a firm texture, and generally inſenſible. Whilſt the fungus is increaſing, the inflammation of the ſcrotum diminiſhes; and if the fungus is at this time removed, a cicatrix is formed in the ſkin, which adheres to the teſticle. There is ſometimes a copious and very fœtid diſcharge from the whole ſurface of the fungus. On diſſection, the fungus is found to ariſe from the pulpy ſubſtance of the teſticle, more or leſs of which remains according to the duration and extent of the diſeaſe.

It may be worth while to remark here, that we have met with one caſe, where, from an abſceſs and ulceration of the ſcrotum, the teſticle itſelf ſlipt out at the ulcerated orifice, and exhibited very much the appearance of the fungus above deſcribed.

178 Treatment. This ſpecies of tumor may be ſafely removed by the knife, by ligature, or by eſcharotics; the removal by the knife is perhaps the ſafeſt, and certainly the moſt expeditious method.

For an account of *Fungus Hæmatodes* in the teſticle, we refer to *Wardrop's Obſervations on Fungus Hæmatodes*.

Sect. II. *Of the Diſeaſes of the Mamma.*

179 General obſervations. From the changes which take place in the female breaſt at the age of puberty, during the menſtrual diſcharge, and before and after the birth of the child, we ought to expect a conſiderable variety in the diſeaſes of this organ; and, in conſidering theſe, we ſhould always keep in view the powerful ſympathy between that gland and the uterine ſyſtem.

The gland of the mamma is ſubject to inflammation and abſceſs. Scrofulous tumors alſo form in it; it is ſubject to a particular diſeaſe, called milk abſceſs, to ſcirrhus, and to other ſpecies of indurations, the nature of which is not well aſcertained.

The nipple and integuments around it are alſo ſubject to particular kinds of excoriations and ulcerations; the lymphatic glands which lie cloſe to the mamma, are alſo frequently diſeaſed, and the contiguous cellular membrane is ſubject to thoſe diſeaſes which are met with in the cellular membrane of other parts of the body.

At the age of puberty, when the uterine ſyſtem becomes fully developed, the female breaſt ſwells, turns hard, and becomes tender, or even painful. A change alſo takes place during pregnancy; the breaſt enlarges, becomes very tender and painful, and a dark-coloured zone is obſerved round the nipple. In women who are ſuckling about the ninth or tenth month after parturition, and ſometimes ſooner, the menſes reappear; and

Of the Diſeaſes of the Mamma.

if the woman afterwards continues to ſuckle, at each monthly return a remarkable change takes place in the milk; it loſes its ſweetneſs, acquires a bitteriſh taſte, becomes of a reddiſh colour, and excites a temporary derangement in the ſyſtem of the child. Obſtructions of the menſes, their final ceſſation, and all the diſeaſes of the womb, affect more or leſs the mamma; and it is at the age of puberty, at the time of menſtruation, during pregnancy, in the early months of ſuckling, and at the time of the ceſſation of the menſes, which are the peculiar periods when blows and other injuries are moſt apt to produce diſeaſe in the mamma.

This conſent between the mamma and uterine ſyſtem ought to be always kept in view when forming our opinion of any diſeaſe in theſe organs; and it is particularly worthy of the notice of ſurgeons when operations on that organ become neceſſary.

1. *Of Inflammation and Abſceſs of the Mamma.*

This diſorder occurs moſt frequently in nurſes by the ſtoppage of the milk, which is always occaſioned by ſudden or imprudent expoſure to cold.

180 Treatment. In the early ſtages of the affection, reſolution is to be attempted, unleſs the ſwelling appears to have an evident tendency towards ſuppuration. The remedies uſed in inflammation, in general, ſeem uſeful in every caſe of inflammation of the breaſts. When the patient happens to be nurſing, a ſudden evacuation of blood is apt to diminiſh the quantity of milk: In ſuch caſes, therefore, blood is to be extracted in ſmall quantities at a time. The application of cooling ſaturnine poultices is adviſeable. When ſuppuration is taking place, fomentations and poultices are to be uſed, and the matter is to be diſcharged by making an inciſion in the moſt depending part of the tumor.

2. *Of Scirrhus and Cancer of the Mamma.*

Cancer has been met with in the female breaſt more frequently than in any other part of the body. We have alſo ſeen an example of it in that gland of the male; but ſuch inſtances are extremely rare.

The commencement and progreſs of a ſcirrhous tumor in the female breaſt, is extremely various in different people; and has been often the cauſe of ſcirrhous tumors, and tumors of a more benign nature, being miſtaken for one another.

181 Symptoms. Scirrhous tumors have generally made ſome progreſs before they are taken notice of. Sometimes they are firſt felt like a pea underneath the ſkin, and lying looſe over the gland of the mamma; in other inſtances, a portion of the central part of the gland is found indurated. Of whatever bulk, and in whatever ſituation the ſwelling be diſcovered, it is remarkable for its unyielding and incompreſſible hardneſs, and its rugged unequal feel.

When the tumor is ſmall it ſeldom gives any pain, and the patient generally diſcovers its preſence by accident. In ſome caſes its exiſtence is diſcovered by an acute pang darting through the breaſt leading to its examination; but in many caſes it acquires the bulk of a large hazel nut or walnut, particularly when the patient is fat, before any circumſtance leads to its diſcovery.

As the tumor increaſes in bulk, it advances towards the ſurface of the body and adheres to the ſkin. The ſkin then becomes thickened, inflamed, and ulcerated. If the tumor be ſituated near the nipple, the diſeaſe ſpeedily affects that part, ſometimes enlarging and hardening it; and in other caſes puckering it and drawing it inwards. When the nipple becomes involved in the diſeaſe, the ſanious fluid formed in the tumor often eſcapes before the ſkin ulcerates, by the lactiferous tubes.

The pain which accompanies the tumor in its more advanced form, is generally of a lancinating kind; but its frequency and degree is ſuſceptible of great variety. Sometimes ſharp ſtinging pains paſs frequently from the tumor as a centre, and extend through the whole breaſt; in other caſes there is more of a burning heat in the part.

The progreſs of the diſeaſe is generally very ſlow, and in many caſes three, four, or more years elapſe before it ulcerates. When ulceration has taken place, the appearance of the ulcer is ſimilar to that we have deſcribed when treating of cancer of the ſkin *; and the progreſs of the ulceration is often ſo ſlow, as that many years elapſe before the diſeaſe proves fatal.

* See Chap. II. ſect. v.

Scirrhous tumors have been met with in the mamma, from the age of twenty or twenty-five, to a very advanced period of life; but they occur about that period, when the catamenia diſappear, much more frequently than at any other.

182 *Treatment.*—There is no part of practice about which leſs has been ſatisfactorily eſtabliſhed, than the treatment of ſcirrhus in the mamma. The good effects of an early extirpation of cancer in the ſkin is very generally admitted; but the want of ſucceſs in removing ſcirrhous mammæ in the hands of many, has not only led ſome ſurgeons to deſiſt performing an operation, except in very recent caſes, but has even deterred others from attempting their removal in the firſt ſtages. There are no doubt many patients who ſubmit to a painful operation from which no relief can be reaſonably expected; on the contrary, the irritation and fever occaſioned by it ſeem to haſten the progreſs of the diſeaſe. But there are others where this practice has had a happier effect, and where the patients have lived for many years without a return of the diſeaſe. Whenever, therefore, a ſcirrhous tumor appears in the mamma, which is moveable and diſtinctly circumſcribed, paſt experience warrants us in removing it. On the other hand, when any of the abſorbent glands have become enlarged and hardened, or when the ſkin has ulcerated, we believe the operation in all ſuch caſes ſhould not be reſorted to. Some ſolitary examples of the diſeaſe, aſſuming this form, may have occurred to individuals, where an operation has arreſted the progreſs of the diſeaſe; but theſe, oppoſed to the vaſt number of unſucceſsful caſes, are by no means ſufficient to warrant us in propoſing the operation.

183 *Method of Extirpating the Mamma.*—In extirpating the mamma, which we ſhall firſt ſuppoſe is to be done where the ſkin is ſound, and where the tumor has no uncommon adheſion to the pectoral muſcle, the patient ought to be placed horizontally in a bed, or upon a table covered with a mattreſs. Two inciſions are to be made with a common ſcalpel through the ſkin and cellular ſubſtance along the whole extent of the tumor, including a ſmall portion of ſkin. When the longeſt diameter of the tumor is acroſs the body, inſtead of a longitudinal inciſion, a tranſverſe one is to be made. The integuments being diſſected from the mamma on both ſides of the inciſions, the patient's arm is to be extended

Of the Diſeaſes of the Mamma.

ed to ſave the pectoral muſcle; and the whole glandular part is to be detached from the muſcle, though a ſmall portion only ſhould be diſeaſed, beginning at the upper ſide, and ſeparating downwards. After the diſeaſed parts are removed, the wound is to be cleaned with a ſponge wrung out of warm water, which will generally render the ſmall bleeding veſſels more conſpicuous. Theſe are to be tied, and the integuments are to be cloſely applied to the parts underneath, and retained there by adheſive ſtraps. A large pledgit of ſimple ointment is now to be laid over the whole; and this is to be covered with a compreſs of lint, tow, or ſoft linen; and the dreſſings to be kept in their place, and moderate preſſure made by a circular roller and ſcapulary bandage.

184 *3. Of Sore Nipples.*

Women are more generally affected with ſore nipples in ſuckling their firſt child than at any future period. This may, in ſome meaſure, be owing to the ſmallneſs of the nipples; but very often it ariſes from their being unaccuſtomed to the irritation of ſucking. In ſome caſes, the nipples are ſo flat, and ſo much ſunk in the breaſt, as to render it difficult for the child to lay hold of them. Here aſſiſtance can ſometimes be given, by the mother preſſing back the prominent part of the breaſt, ſo as to make the nipple project between two of her fingers. Should this be inſufficient, the nipple may be made to project by applying to it a ſtout child ſeveral months old: but when this cannot be done, breaſt-glaſſes * may anſwer the ſame purpoſe. By applying theſe to the nipple, and ſucking out the air, the child will commonly be enabled to lay hold of it.

* See Plate DXV.

The nipples at this time are liable to excoriations, cracks, or chops; which, though not attended with a formidable appearance, are frequently more diſtreſſing than large ulcers. Mild, aſtringent, and drying applications are moſt to be depended upon in ſuch complaints; ſaturnine water, or lime-water, will anſwer; and either ought to be applied warm. After bathing the parts with any of theſe, the nipple ſhould be covered with Goulard's cerate. Even a little ſoft pomatum frequently rubbed upon the part, and covered with a ſoft linen rag, is ſometimes found to give conſiderable relief. But the nipple ſhould be perfectly cleared of theſe applications before the child is laid to the breaſt; and this may be done with a little port wine, or equal parts of brandy and vinegar. If proper attention be paid to theſe remedies, they will commonly be found to have the deſired effect; but if the contrary ſhould happen, another remains to be mentioned, which, in different inſtances, has given great relief: it conſiſts in the application of a thin ſkin to the nipple, as the neck and part of the body of a ſwine's bladder with an aperture in it; which, being properly moiſtened and fixed to the breaſt, will completely protect it in the time of ſucking. As long as the nipples remain any way affected, ſmall cups of glaſs or tin are uſeful for retaining the dreſſings, defending the nipples from the friction of the clothes, and receiving any milk which may fall from the breaſt.

185 Anomalous ſwellings of the mamma.

Swellings and hardneſſes are found in the breaſt which are not of a ſcirrhous nature. Scrofulous indurations are particularly frequent. They often become old and hard, and are then commonly conſidered as *ſcirrhus*. If the ſurgeon ſucceeds in diſcuſſing them by means of any kind of remedy, he is apt to think that he has diſcuſſed a ſcirrhus. Theſe ſcrofulous ſwellings ſometimes inflame, and the progreſs of the inflammation is very tedious. The breaſt is long painful before any ſoftening or fluctuation can be perceived. The ſurgeon then perhaps conſiders it as an occult cancer, extirpates it, and thinks that he has ſucceſsfully cured a *cancerous* affection. If the ſurgeon opens ſuch a ſuppurating knot before all the hardneſs is diſſolved by the ſuppuration, and if he makes a large opening, then commonly follows a very malignant ulcer, which may be alſo miſtaken for a cancerous ſore. Many caſes, where ulcerated cancers have been ſuppoſed to have been extirpated with ſucceſs, may have been of this kind.

Venereal indurations are not unfrequent in the breaſt, and alſo cauſe ſimilar miſtakes in practice. Encyſted tumors are alſo met with in the breaſt, and are moſt commonly of that kind called *meliceris*.

In the breaſt of young girls, ten or twelve years of age, hardneſſes ſometimes appear, which diſappear as ſoon as menſtruation takes place. Sometimes they do not go away until the firſt delivery. Sometimes the breaſt ſwells to an enormous ſize, and becomes indeed not hard, but throughout firm, like muſcular fleſh. In ſuch a caſe the extirpation has been ſucceſsfully performed.

Sometimes conſiderable and often quite hard ſwellings appear in the breaſts, which proceed merely from blood. In ſuch caſes blood flows from the nipple at each menſtrual period. When the menſes diſappear with years, the diſcharge of blood no longer appears from the breaſt; but then there is a hard not painful ſwelling ariſes, which often acquires a conſiderable ſize. If it is opened, coagulated and fluid blood is diſcharged, and a fiſtula follows, which diſcharges a purulent fluid, and ſometimes pure blood, and often continues ſeveral years, without giving great uneaſineſs. The ſwelling, which was at firſt quite hard, ſometimes becomes ſoft, and then the ſurgeon is commonly induced to open it. Sometimes ſuch ſwellings are obſerved in women who have the menſtrual diſcharge; and in ſuch caſes the ſwelling always becomes greater at each period. Sometimes hectic fever and death follow the opening of theſe tumors. (Monro). The mamma is alſo ſubject to *fungus hæmatodes*; for an account of which, we refer our readers to Wardrop's *Obſervations on Fungus Hæmatodes*.

186

SECT. III. *Of the Diſeaſes of the Tonſils and Uvula.*

1. *Of the Enlargement of the Tonſils and Uvula.*

THE tonſils ſometimes grow ſo large and hard as to become incurable, and even to threaten ſuffocation. The tumors have been commonly conſidered to be of a ſcirrhous nature; but they are neither attended with ſhooting pain, nor are they apt to degenerate into cancer; neither do ſwellings return after the tonſils have been extirpated: hence they ought not to be removed till by their ſize they eſſentially impede deglutition or reſpiration; but whenever they do this, they may be removed with ſafety. The only proper method of removing them is by ligature, which is not only void of danger,

187 Treatment.

Of the Diſeaſes of the Tonſils and Uvula.

danger, but ſeldom fails to perform a cure. If the baſe of the tonſil be ſmaller than the top, the ligature is to be uſed as for polypi in the throat; but however broad the baſe of it may be, much difficulty will ſeldom occur in fixing it, for the ſwelling is always very prominent. In diſeaſes of this kind both tonſils are generally affected; but if the removal of one of them forms a ſufficient paſſage for the food, the other may be allowed to remain. When, however, it is neceſſary to extirpate them both, the inflammatory ſymptoms produced by the extirpation of the firſt ſhould be allowed to ſubſide before any attempt be made to remove the other.

When the form of the tonſils happens to be conical, ſo that the ligature would be apt to ſlip over their extremities, Mr Cheſelden has recommended a needle (Plate DXV.) with an eye near the point: a double ligature being put into the eye, the inſtrument is to be puſhed through the centre of the baſe of the tumor, and the ligature being laid hold of by a hook and pulled forwards, the inſtrument is to be withdrawn; then the ligature is to be divided, and ſo tied that each part may ſurround one half of the tumor. This method, however, is ſcarcely ever found to be neceſſary.

188 Enlargements of the uvula.

Enlargements of the uvula, from inflammation or from other cauſes, may generally be removed by the frequent uſe of aſtringent gargles, as of ſtrong infuſions of red roſe-leaves or of Peruvian bark. But when theſe fail, and the enlargement is ſo conſiderable as to give great uneaſineſs by impeding deglutition, irritating the throat, and ſo cauſing cough, retching, and vomiting, extirpation is the only thing upon which any dependence can be placed. Exciſion is the readieſt method when the uvula is only elongated; but when the ſize is conſiderable, dangerous hæmorrhagies ſometimes attend this method; on which account a ligature is preferable.

189 Treatment.

In performing the operation, the ſpeculum oris (Plate DXV.) is neceſſary to keep the mouth ſufficiently open, and the uvula ſhould be laid hold of by a pair of forceps or a ſmall hook, ſo as to keep it firm, and prevent it from falling into the throat. After the operation, if the bleeding be conſiderable, it may be checked by aſtringent gargles, or by touching the part with lunar cauſtic; but this will ſeldom be neceſſary.

When a ligature is to be employed, it may be readily done according to the method recommended in the extirpation of polypi. A double canula with a ligature may be paſſed through the noſe, or the ligature may be applied according to Cheſelden's method in extirpation of the tonſils.

190 *2. Of Scarifying and Fomenting the Throat.*

In inflammatory affections of the throat, the means commonly employed are gargles, fomentations, ſcarification, or topical bleeding. Gargles are uſeful for cleaning the fauces from mucus, or in caſes of ulceration. In relaxation of the parts, they are employed with advantage when made of aſtringent materials. Fomentations may be of ſome uſe when externally applied; but the ſteam of water, &c. drawn into the throat, by means of Mudge's inhaler (Plate DXV.), is preferable. Sometimes it is neceſſary to draw blood from the part affected. Here recourſe may be had to ſcarifying, which may be readily done by the ſcarificator (Plate DXIV. fig. 14.). After a ſufficient number of punctures have been made, the flow of blood may be promoted by the patient's frequently applying warm water to the punctures. When an abſceſs forms, notwithſtanding the uſe of theſe remedies, the matter may be diſcharged with the ſcarificator already mentioned.

Of the Diſeaſes of the Eye.

Chap. X.

Of the Diſeaſes of the Eye and its Appendages.

191

In the account of the diſeaſes of the eye, we ſhall follow the ſame principles of arrangement as we have already adopted, and treat of the diſeaſes of each particular texture of which the eye is compoſed, in the order in which they appear moſt natural; as the diſeaſes of the *conjunctiva*, *cornea*, *iris*, *cryſtalline lens*, &c.

Sect. I. *Of Inflammation of the Conjunctiva.*

192 General remarks.

The general phenomena of inflammation of the conjunctiva, are analogous to thoſe which have been already enumerated, when treating of the inflammation of *mucous* membranes*. Along with the ſymptoms there enumerated, there are others which ariſe from the peculiar functions of the organ. The eye cannot endure the uſual quantity of light, viſion becomes obſcured, and there is an increaſed ſecretion of tears. The inflammation is ſometimes confined to the palpebræ, ſometimes to the conjunctiva covering the white of the eye, in ſome caſes to that portion of it which forms the external layer of the cornea, and in others it ſpreads over the whole of theſe ſurfaces. Theſe differences merely regard the extent of the inflammation: but there are others which ariſe from a difference in the ſpecific nature of the diſeaſe, forming three diſtinct ſpecies; 1. The purulent ophthalmia; 2. The purulent eyes of new-born children; and, 3. The gonorrhœal ophthalmia.

* See Chap. III.

1. *Of the Purulent Ophthalmia.*

193 Symptoms.

The purulent ophthalmia appeared in this country as an epidemic after the return of our troops from Egypt in the year 1801. Since that period, it has ſpread with the greateſt violence over moſt part of Britain. This diſeaſe generally begins with a peculiar purple-coloured redneſs over the whole eyeball and inner membrane of the eyelids. There is a ſudden pain produced in the eye, as if ſand or ſome foreign ſubſtance was lodged between it and the eyelid. As the redneſs increaſes, the conjunctiva becomes ſwelled, from the effuſion of a tranſparent fluid in the looſe cellular membranes, between it and the ſclerotic coat. There is at firſt a profuſe diſcharge of tears from the eye, and the eyelaſhes are glued together when the patient awakes. There is ſoon created intenſe pain in the ball of the eye, and a dull aching pain in the forehead. The cornea ſometimes becomes opaque; and if the violence of the inflammation continues, it ulcerates and ruptures, allowing the aqueous humour to be diſcharged; after which, an abatement of the inflammatory ſymptoms generally takes place.

Before the diſeaſe advances thus far, the eyelids are generally conſiderably ſwelled; and, beſides the flow of

tears,

tears, there is a profuſe diſcharge of a puriform fluid. The inflammation uſually attacks both eyes, and it begins in one ſeveral days before the other.

194 *Treatment.*—In ſlighter caſes of the diſeaſe, fomenting the eye with a decoction of poppy heads, and a briſk purge, have been found ſufficient to abate the inflammatory ſymptoms. In other caſes, however, it has been neceſſary to draw blood to a very great extent. When the diſeaſe occurs in a ſtrong plethoric perſon, recourſe ſhould be immediately had to the lancet, and the operation repeated on any recurrence of the ſymptoms. It has been the uſual practice of Dr Veitch, and of thoſe who have had extenſive opportunities of treating this diſeaſe, to draw the blood from the arm. A ſmaller quantity, however, taken from the temporal artery or external jugular vein, would be found to have an equally good effect.

When the purulent diſcharge becomes profuſe, ſome have recommended the uſe of collyria, in the form of injections. The aqua camphorata is recommended by Mr Ware; and a weak ſolution of corroſive ſublimate, with opium, has been found to have equally good effects. In thoſe caſes where there is much pain and tenſion in the eyeball and brow, along with a turbid ſtate of the anterior chamber, and ulceration beginning in the cornea, the diſcharge of the aqueous humour has been attended with much ſucceſs*. This operation may be eaſily, and at all times ſafely performed, by making a puncture with a common extracting knife, through the ſound part of the cornea, near its junction with the ſclerotic coat.

* See *Mr Ware's Treatiſe on the Purulent Ophthalmia.*

195 2. *Of the Purulent Ophthalmia in Children.*

The ſymptoms of the purulent eyes of children are very ſimilar to thoſe which have been mentioned. The diſeaſe generally appears a few days after birth, by an increaſed redneſs of the palpebral membrane, more or leſs ſwelling, and a puriform diſcharge. Sometimes the membrane ſwells ſo much as to evert the eyelids, and render it impoſſible to examine the eye-ball. The cornea becomes obſcure, ulcerates, and allows the aqueous humour to be diſcharged. The diſeaſe generally affects both eyes. From what we know of the origin of purulent ophthalmia, and from ſome ingenious obſervations of Mr Gibſon of Mancheſter,* it appears probable, that the origin of this diſeaſe is communicated by the lodgement of an acrimonious diſcharge upon the eyes of the child, from the vagina of the mother. In a great proportion of caſes, Mr Gibſon found the mothers of thoſe children, affected with purulent ophthalmia, had leucorrhœa; and it is probable, that this, as well as other acrimonious diſcharges, which we know to take place from the mucous membranes of theſe parts, produces the diſeaſe.

* See *The Edinburgh Medical and Surgical Journal*, vol. iii

196 *Treatment.*—Solutions of ſaccharum ſaturni and opium, injected between the eyelids, or the aqua camphorata of *Beates*, ought to be employed in the firſt ſtage of the diſeaſe; and the eyelids ought to be likewiſe covered with ſome mild unctuous application. When ulceration has advanced ſo as to endanger a rupture of the cornea, that may be prevented by diſcharging the aqueous humour. In the ſecond ſtage of the inflammation, ſcarifying the eyelids, and applying the red precipitate ointment, will generally be found to be uſeful in allaying the inflammation and ſwelling of the eyelids, and in reſtoring the tranſparency of the cornea.

3. *Of the Gonorrhœal Ophthalmia.* 197

The gonorrhœal ophthalmia occurs very rarely; and it has been known to ariſe from the ſuppreſſion of a gonorrhœa, or from the accidental application of the gonorrhœal matter to the eyes. In this reſpect, its origin is very ſimilar to the common purulent or Egyptian ophthalmia, and to the purulent ophthalmia which occurs in children.

The ſymptoms and progreſs of the diſeaſe are alſo ſimilar, only that its progreſs is much more violent, and it generally completely deſtroys the organ.

Treatment.—When it is ſuſpected that the diſeaſe has 198
ariſen from a ſuppreſſed gonorrhœa, ſuch means ought to be employed as are moſt likely to reſtore the diſcharge from the urethra; ſuch as the introduction of a bougie, the injecting of warm oil, and the application of poultices and fomentations to the perinæum. If the inflammatory ſymptoms run high, powerful evacuants ſhould be employed. Beſides purgatives, blood ſhould be taken from the arm or temporal artery.

The local applications ſhould conſiſt of weak injections of corroſive ſublimate and opium, or acetate of lead and opium; and the ſwelling and redneſs may be alſo relieved by the application of the red precipitate ointment, or the ointment of Janin.

SECT. II. *Of the Pterigium.* 199

The word pterigium denotes all thoſe morbid changes in which that portion of the conjunctiva covering any part of the cornea or ſclerotic coat becomes thickened, vaſcular, and opaque. If the diſeaſe be confined to a particular part of the conjunctiva, the diſeaſe is obſerved at its commencement like a ſmall globule of fat, or condenſed cellular ſubſtance, ſituated moſt frequently near the junction of the cornea and ſclerotic coat; and this ſpot extending imperceptibly along the ſurface of the conjunctiva at length paſſes over the cornea, the conjunctiva on the adjoining part of the ſclerotic coat becomes puckered, and as if it were forcibly drawn over the cornea. The portion of it which lies on the ſclerotic coat is commonly looſe, and can be eaſily elevated, but that which is on the cornea adheres more firmly. This ſpecies of pterigium has generally a triangular form; one of the angles of the triangle advancing towards the cornea, or covering a portion of it, and the baſe lying on the ſclerotic coat. Sometimes the thickening of the conjunctiva is firſt perceived on the cornea. The conjunctiva covering the ſclerotic coat remaining quite ſound. A pterigium is always conſiderably elevated above the adjacent cornea; but the degree of its thickneſs varies from that of a thin membrane to that of a fleſhy maſs.

Pterigia ariſe moſt commonly at the naſal angle of the eyeball. They are formed, alſo, at the temporal angle; and they ſometimes occur at both places in the ſame eye. In one caſe there were two pterigia in each eye. They are formed very rarely on the upper and under parts of the eyeball.

Treatment.—The only mode of removing this diſeaſe 200
is by exciſion. This may be done by elevating the diſeaſed portion of the conjunctiva with a pair of forceps; and ſeparating it at its baſe by cutting it through with a pair

pair of ſciſſars; and then carefully diſſecting it off to its apex. If any portion of it has been allowed to remain, or if the wound ſhews any tendency to form a fungus, lunar cauſtic ought to be applied to it, and the application repeated as often as may appear neceſſary. Any ſlight inflammation or weakneſs in the eye which may continue after the operation, may be ſpeedily removed by the application of the vinous tincture of opium.

Sect. III. *Of Puſtules* (Ophthalmia puſtuloſa).

201 Symptoms.

Puſtules are ſmall tumors which are formed both on the cornea and ſclerotic coat, but they occur moſt frequently near the junction of theſe membranes. A puſtule commonly firſt appears like a duſky yellow or reddiſh ſpot, a little elevated above the ſurface of the cornea or ſclerotic coat; and in a ſhort time it becomes a diſtinct conical tumor. The adjacent part of the cornea is always more or leſs dim; and a conſiderable degree of inflammation accompanies it, which is either confined to the white of the eye contiguous to the puſtule, or is ſpread over the whole eyeball. Whilſt the puſtule is forming, the inflammation is generally confined to that part of the white of the eye which is in its immediate vicinity. The blood veſſels are of a pale livid hue; they appear ſuperficial, and can be readily elevated by a pointed inſtrument; each trunk can be diſtinguiſhed, for they are never ſo numerous as to appear confuſed, or like one red maſs. They ſometimes run in various directions, anaſtomoſe freely with one another, forming net-works upon the white of the eye.

If the inflammation and puſtule remain for ſome time, the puſtule generally advances to ſuppuration. When ſuppuration takes place, the apex of the puſtule ulcerates, and frequently a chalky white ſpot appears at the centre of the ulceration; and the opacity of the cornea at the ſame time daily increaſes around it. In other caſes, the opaque matter ſeparates, and leaves behind it a deep ulcerous excavation.

Sometimes the ſuppuration proceeds more like a common pimple or phlegmon of the ſkin; a ſmall quantity of a thick matter collects within the puſtule, and when it is diſcharged, a conical tumor remains, which has a depreſſion at the apex. When the puſtule contains a watery fluid, the fluid is moſt frequently abſorbed in a gradual manner; but at other times the puſtule breaks, and an ulcer is formed.

If, in either of theſe caſes, the contents are artificially diſcharged, all the accompanying inflammatory ſymptoms are much increaſed.

Moſt frequently there is only one puſtule, and only one eye affected; but in ſome caſes there are ſeveral both on the cornea and ſclerotic coat of each eye.

The diſeaſe, at its commencement, is almoſt invariably accompanied with the ſenſation of a mote in the eye, and the whole conjunctiva covering the ſclerotic coat has often a yellowiſh and ſhining glaſſy colour before the redneſs appears. There is often, alſo, a degree of redneſs and ſwelling, chiefly of the upper eyelid; and the tarſi are found adhering together in the morning, from the exudation of a yellow matter among the ciliæ. There is frequently an unuſual dryneſs felt in the eye; but if it be expoſed to a bright light, or if an attempt be made to uſe it, the ſecretion of tears is increaſed.

This ſpecies of inflammation is always accompanied with a much greater degree of general fever, in proportion to the ſeverity of the local ſymptoms, than any other ophthalmia. The pain is rarely acute till the puſtule ulcerates; but, if that takes place, it is commonly very ſevere.

An eye which has been once affected with puſtule, is very ſubject to repeated attacks of the diſeaſe. Puſtules of the cornea are met with in people of all ages; but they are more common in young people than in thoſe advanced in life.

Treatment.—Sudorific medicines, cooling diluent drinks, and purgatives, ought to be employed in the firſt ſtage of the diſeaſe; and given according to the violence of the conſtitutional ſymptoms. The eye, and parts around it, ſhould be fomented three or four times a-day, with a decoction of poppy heads; to which may be added a ſmall quantity of ſpirits. When the ſymptomatic fever abates, and the redneſs aſſumes a more purple hue, the vinous tincture of opium may be applied to the eye once or twice a-day; and this will be found equally uſeful whether the puſtule is in a ſtate of ſuppuration or not; and it ought to be continued as long as there are any remains of the diſeaſe.

Sect. IV. *Of Matter collected between the Lamellæ of the Cornea.* 202

Purulent matter is ſometimes collected between the lamellæ of the cornea, when the diſeaſe is termed *unguis* or *onix;* or in the anterior chamber, when it is called *hypopion.*

When the matter is collected between the lamellæ of the cornea, it appears in the form of a yellow ſpot; and as the quantity increaſes, the ſpot becomes larger, but does not alter its ſituation from the poſition of the head.

When the matter is collected in the anterior chamber, it generally appears like a ſmall yellow globule between the iris and cornea, occupying the inferior part of the cavity. Theſe abſceſſes are commonly the effect of violent ophthalmia, occaſioned by a blow, or injuries of the eyeball; they are alſo formed, though rarely, without any accompanying inflammatory ſymptoms.

Treatment.—Though the purulent matter may be more or leſs abſorbed on the abatement of the accompanying inflammatory ſymptoms; yet it would be found a good general practice to evacuate the matter whenever it appears, by making an inciſion through the cornea. The diſcharge of the aqueous humor along with the matter, never fails to diminiſh the inflammation; and this perhaps may be the reaſon why the practice is ſo uſeful. Beſides this, fomentations, briſk purges, and cupping at the temples, may be neceſſary if the inflammatory ſymptoms are ſevere.

Sect. V. *Of Ulcers of the Cornea.* 203

Ulcers of the cornea have been divided by ſome authors into a number of ſpecies, from differences in their ſize, in their duration, in the degree of the ſeverity of the accompanying ſymptoms, and from the various cauſes from which they have been ſuppoſed to originate.

The moſt frequent variety of ulcer, is that which remains after the cornea has ſuppurated and burſt; either in conſequence of a puſtule or of an abſceſs.

When a puſtule ſuppurates, the central part of it generally

nerally gives way; and as the diſeaſe continues, the ulceration extends in all directions from that point. Ulcers of this kind are generally circular, and the edges rounded and ſmooth; having ſometimes the appearance of a ſmall artificial dimple: in other inſtances they have an irregular ſhape, and their edges are jagged and acute. The ſize of ulcers is very various; in ſome caſes they do not appear larger than a depreſſion made by the point of a pin, whilſt in others they cover a large ſurface. Moſt frequently the part of the cornea contiguous to the ulcer becomes more or leſs dim; and in ſome caſes red veſſels may alſo be traced in it.

Treatment.—The acute pain which generally attends moſt ulcers, particularly thoſe which are the conſequence of puſtules, will generally be much relieved by the application of the vinous tincture of opium, repeated two or three times a day. When this produces no good effect, and the ulcer ſpreads rapidly, attended with acute pain, much relief will be obtained by touching the ſurface of it with lunar cauſtic, or if there is a riſk of the ulcer eroding the whole thickneſs of the cornea, and a prolapſus of the iris to take place, it may be adviſable to prevent this by diſcharging the aqueous humor.

204 SECT. VI. *Of Specks of the Cornea.*

There are three forms of the corneal ſpeck; the *firſt* and moſt ſimple variety, is when a particular part of the cornea loſes its natural tranſparency, and appears clouded; objects being ſeen by the patient as if looked at through a miſt or ſmoke. Some of theſe ſpecks are undefined, others diſtinctly circumſcribed, and they have each an equal degree of opacity throughout, or one part is more opaque than the reſt. They are moſt commonly of a circular form; but in ſome caſes their ſhape is very irregular. This ſize varies from the ſmalleſt ſpot, to ſuch an extent as occupies the whole cornea.

In the *ſecond* form of the corneal ſpeck, the opacity is of a darker ſhade, giving the cornea a bluiſh, or in ſome parts a milky appearance. It is ſeldom equally opaque through its whole extent; being generally more ſo at the centre, and becoming gradually of a lighter ſhade towards the margin. In ſome inſtances the ſhade is very unequal in the different parts of the ſpeck.

In the *third* form of the corneal ſpeck, the cornea becomes of the opaque gliſtening white colour of common pearl, and the opacity generally extends through the whole of the lamellæ of the cornea; ſo that if even ſeveral of thoſe layers which are external be removed, the remaining ones completely interrupt viſion. Specks of this deſcription ſometimes produce a ſlight thickening of the cornea, and are accompanied by adheſions between the cornea and iris. They are almoſt always diſtinctly circumſcribed, though generally not ſo opaque at the edge. When they are of any conſiderable ſize, they are nouriſhed by one or more red veſſels.

In the firſt form of ſpeck, the iris can be ſeen through the diſeaſed portion of the cornea; but in the ſecond and third form of the diſeaſe, the degree of opacity is ſuch, that nothing can accurately be diſtinguiſhed behind it. If there is an external inflammation accompanying the ſpeck, the red veſſels will be ſeen in a cluſter on that part of the ſclerotic part neareſt to it; and ſome of the branches can often be traced paſſing over the edge of the cornea, and terminating in the ſubſtance of the ſpeck. As the accompanying inflammation abates, the number of the red veſſels on the cornea commonly diminiſhes; but ſometimes one or more trunks remain, and are diſtributed on the ſpeck. In ſome caſes, there are large ſpecks with numerous blood-veſſels ſupplying them during the continuance of active inflammation; and although the opacity remains extenſive after the inflammation abates, yet no red veſſels continue to nouriſh it. The number of blood-veſſels is in no caſe in proportion to the degree or extent of the opacity during any ſtage of the accompanying inflammation. For we frequently obſerve a net-work of blood-veſſels on a cornea which has very little obſcurity, and at other times there is a large opaque ſpot, with only one, or even without a ſingle red veſſel ſupplying it. Specks appear on every part of the cornea, but moſt frequently towards its centre.

Specks appear to be formed moſt frequently on the external lamella of the cornea; but it is difficult to determine accurately their ſituation. They vary in number. Commonly there is only one; but it frequently happens that there are two, three, or more diſtinct ſpots on one cornea, all of which differ in their ſize, ſhape, and in degree of opacity.

Specks impede viſion in proportion to the degree of their obſcurity, and according to their ſituation. Even a ſpeck of the ſlighteſt ſhade, which is hardly perceptible to a common obſerver, if it be placed directly oppoſite the pupil, materially injures the ſight; whereas thoſe of the opake kind, if placed beyond its circumference, diminiſh the ſphere, but not the diſtinctneſs of viſion. In thoſe caſes where the ſpeck is of a moderate ſize, and placed towards the centre of the cornea, the patient ſees better in a dull, than in a clear light. For in a clear light the pupil contracts ſo much, that it becomes covered by the ſpeck, and the rays of light are prevented from entering; but in a dull light it becomes larger, ſo that the rays of light enter by its edge.

Specks, moſt commonly, are either preceded or accompanied by inflammation of the cornea. Likewiſe wounds, if they do not unite without ſuppuration, and ulcers of the cornea, are followed by a ſpeck.

Specks are formed at every period of life; but they occur moſt frequently in young people; probably becauſe in them the cornea is much ſofter, and more ſpongy; and alſo as they are more ſubject to inflammatory complaints of the eye than adults.

Treatment.—Thoſe ſpecks which have been deſcribed under the *firſt* and *ſecond* form of the diſeaſe, generally 205
diſappear either by the uſe of remedies, or in ſome caſes after the inflammatory ſymptoms abate.

When the eye is inflamed, and the eyelids turgid with blood, ſlightly ſcarifying the eyelids, and immediately after the bleeding ceaſes, applying a quantity of an ointment compoſed of the red oxide of mercury (ten grains to a dram of ſimple ointment), will be found a very active remedy. And the ſcarifications along with the ointment ſhould be repeated every ſecond or third day as long as any inflammation continues. When there is no inflammation accompanying the ſpeck, the ointment may be applied alone. The unguentum citrinum, and various powders compoſed of the ſulphate of alum, ſulphate of zinc, ſub-borate of ſoda, diluted with from a fourth to an eighth

eighth part of ſugar, may alſo be advantageouſly employed. In ſpecks of long duration, it will be found uſeful to vary the application, and to employ two or three of the above medicines ten days or a fortnight alternately.

Thoſe ſpecks of the *third* form, ſeldom become more tranſparent, even by the uſe of the moſt active remedies. In thoſe caſes where only a ſmall central portion is of that deſcription, the ſize of the ſpeck may be diminiſhed by the treatment already mentioned; and in ſome caſes, much benefit has ariſen from cutting away an external layer of the moſt opaque part; and afterwards uſing the above applications. It often happens, however, that if portions of a very old and opaque ſpeck be cut away, the part is regenerated by an equally opaque matter.

The ſpecks which are formed rapidly, are in general moſt ſpeedily removed. They go away, too, much more quickly in children than in old people; and in them, alſo, a much greater degree of obſcurity can be made entirely to diſappear. When a part of the cornea has become opaque, the opacity begins to diſappear at the circumference of the ſpeck, or at that portion of it neareſt to the circumference of the cornea. In ſome caſes it may alſo be obſerved, that the external laminæ of the cornea firſt regain their tranſparency.

206 SECT. VII. *Of the Staphyloma.*

When the cornea, beſides loſing its tranſparency, ſwells to ſuch a degree, that its internal ſurface comes in contact with, and adheres to the iris, and when it forms a prominent tumor externally, the diſeaſe has generally been called *ſtaphyloma*. When the whole cornea is affected, it generally aſſumes a more or leſs conical form; loſes entirely its natural tranſparency; and viſion is completely deſtroyed. The opacity is generally moſt remarkable towards the apex of the tumor, and is generally of a pearl white colour diffuſed through the whole corneal ſubſtance. The internal ſurface of the cornea adheres to the iris, and the pupil is in moſt caſes altogether obliterated.

In many caſes the cornea does not project beyond the eyelids; but in others, particularly in children, a large tumor is formed, which projects beyond the eyelids, and is attended with pain and inflammation, which, in ſome inſtances, renders the other eye weak and irritable.

Treatment.—When a part of the tumor gives way, and allows the contents of the tumor to be diſcharged, the patient always experiences a ſpeedy relief, but the tumor is ſoon formed again; ſo that in order to prevent its growth, it is neceſſary not only to diſcharge its contents, but alſo to remove a portion of the diſeaſed cornea of ſuch a ſize as to prevent the humors from again collecting. A common extracting knife may be paſſed through the tumor, ſo as to divide a ſegment nearly equal to half the cornea, and the other half may be readily cut away with ſciſſars. Inflammation and ſuppuration ſucceed; and the eyeball finally collapſes if there be not a ſufficient degree of inflammation excited. A pointed inſtrument may be introduced through the wound, ſo as to allow the cryſtalline lens, or any portion of the vitreous humour which may have remained, to be preſſed out.

SECT. VIII. *Of Inflammation of the Iris.* 207

Inflammation ſeldom affects the iris alone, though in ſome caſes it appears to be the principal diſeaſed part of the organ. The diſeaſe is accompanied with intenſe pain on expoſure to light; diſcoloration of the iris from the addition of red blood; diſpoſition of the pupil to contract; and lymph to be effuſed on the ſurface of the iris and pupil.

Treatment.—Copious bleedings from the arm, or temporal artery, are generally neceſſary; and in order to prevent any permanent contraction of the pupil from taking place, much benefit will be derived from keeping it dilated by the action of an infuſion of *belladona*.

SECT. IX. *Of the Mode of making an Artificial Pupil.* 208

The iris, whether from previous inflammation or other cauſe, has been often found with the pupil ſo much contracted, and adheſions formed between it and the capſule of the cryſtalline, to ſuch a degree, as to prevent viſion. The pupillar edge of the iris, too, ſometimes adheres to the cornea, and is contracted; and ſometimes a portion of cornea oppoſite to the pupil is a cauſe of blindneſs. In all ſuch caſes it has been repeatedly attempted to make an artificial pupil; but this operation has ſeldom been ſucceſsful. Various modes have been propoſed to perform it, but that recommended by Scarpa is entitled to moſt attention. This method conſiſts in introducing a curved couching needle (Plate DXVII. fig. 20.), as in the operation of couching the cataract, paſſing its point through the iris at the place where it is intended the new opening ſhould be made, and then forcibly tearing down a portion of iris from its connection with the ciliary ligament. After the operation it will be found uſeful to keep the iris for ſome time under the influence of belladona. We underſtand that Mr Gibſon, an ingenious ſurgeon in Mancheſter, has operated with great ſucceſs in a new manner. He makes the punctuation of the cornea at its tranſparent part with an extracting knife (Plate DXVII. fig. 1.), and preſſes the eyeball ſo as to ſqueeze the iris through the inciſion of the cornea; or if any adheſions render that impracticable, he drags it out with a hook (Plate DXVII. fig. 19.), and afterwards cuts away with a ſciſſars the prolapſed portion. Then immediately the perforated iris falls back into its natural ſituation, leaving a proper opening.

SECT. X. *Of the Cataract.* 209

The moſt common diſeaſe of the lens is a loſs of its natural tranſparency; and this ariſes either from a change in its ſtructure, or from a depoſition of new matter. The capſule of the lens is alſo ſubject to opacities. Theſe diſeaſes are known by the name of *cataract*.

There are *four* ſpecies of cataract generally enumerated. In the firſt, the cryſtalline lens itſelf becomes opake (*cataracta cryſtallina*). In the ſecond, the capſule is changed in its ſtructure (*cataracta membranacea*). In the third, the liquor Morgagni becomes opake (*cataracta interſtitialis*); and when all thoſe parts are affected at the ſame time, it has been denominated the mixed cataract, *cataracta mixta*.

Of the Diſeaſes of the Eye.

When the cryſtalline lens becomes opake, the opacity generally begins towards the central part of the lens, and extends towards its circumference; in other caſes a general obſcurity extends over the whole lens.

210 Conſiſtence of cataracts.

The conſiſtence of the lens varies very much in the different kinds of cataract. Sometimes it is converted into an aqueous or milky fluid, or like thin jelly; at other times it becomes harder and firmer than natural; and in ſeveral caſes it has been found converted into bone or into a chalky looking ſubſtance. It has been generally remarked, that the fluid or milky cataract is moſt frequent in children, but we have alſo met with it in thoſe advanced in life. The ſolid or concrete cataract, on the other hand, has been generally found in adults. At the ſame time, we have obſerved the lens of young people converted into a hard and white ſubſtance reſembling chalk.

211 Colour of cataracts.

The colour of different cataracts is very various; and they never appear of the ſame colour in the eye as when removed from it. The moſt uſual colour of them in the eye is a bluiſh white or gray; ſometimes clouded in different parts or ſtriated, ſometimes of a lead colour, ſometimes greeniſh, and ſometimes of a yellow or amber colour. When taken out of the body, thoſe which appeared white or gray are generally dark yellow or amber; and thoſe of a yellow tinge in the eye often appear white when extracted.

212 Diagnoſis between hard and ſoft cataracts.

There is ſcarcely any diagnoſtic mark of a ſoft and hard cataract which can be altogether depended on. The colour proves nothing, thoſe of a milky colour being often quite hard, and ſometimes thoſe of a pearl colour are quite ſoft. Neither is there any thing to be learnt from the degree of the opacity; for it will be found that thoſe who ſee no more than to be able to diſtinguiſh light from darkneſs have the lens quite ſoft, whilſt thoſe who can diſtinguiſh colours and large objects have the lens quite hard. Richter, however, has remarked two ſymptoms, which he ſays have ſeldom deceived him in aſcertaining this point. The ſofter the lens is, the larger and thicker it is in general, and therefore approaches nearer to the plane of the iris or to the edge of the pupil. Hence he always concludes that the cataract is ſoft when it is near the pupil. In order, however, to judge of the ſpace between the pupil and lens, the ſurgeon muſt look into the patient's eye from one ſide; and in general it requires much experience to judge of this with accuracy.

We are alſo able, in ſome caſes, to diſcern points, ſtreaks, or inequalities, in the ſhade of a cataract. If, after having obſerved the place, figure, and diſpoſition of them, we find that in ſome days afterwards, or upon rubbing the eye pretty hard, they have undergone any change in their figure, ſituation, or ſhade of colour, we may then conclude with certainty that the cataract is ſoft; only we muſt be cautious not to draw an oppoſite concluſion, viz. that we are not to conceive the cataract to be hard if theſe changes ſhould not be perceptible.

* See *Bemerkungen, uber den Grauer Star.*

"A perfectly *hard* cataract," ſays Beer,* "ſhows itſelf very plainly before the operation; the pupil is equally opake in its whole circumference; there are not to be obſerved any points, ſtreaks, or ſpots, of a clearer or darker colour; the lens is evidently ſeparated from the iris, ſo that a ſufficient number of rays of light can enter, and the patient is ſtill capable of diſtinguiſhing ſome objects from the ſide of the eye; the motions of the pupil are extremely lively, and it never remains conſiderably enlarged. The opacity behind the pupil at the commencement of the diſeaſe is firſt obſerved in the middle, and it then extends, but very ſlowly, towards the circumference. Such patients, if the middle part of the pupil is completely opake, can for the moſt part read writing by the aſſiſtance of a magnifying glaſs, and diſtinguiſh ſmall objects. The colour of the hard cataract is gray, paſſing more or leſs to a greeniſh hue; and the ſmooth level of the lens may be very plainly remarked."

213 Cataract generally a local diſeaſe.

In moſt patients the cataract is to be conſidered as a local diſeaſe, though there are alſo many caſes where an opacity of the lens comes on after or along with other diſeaſes of the eye. It has been obſerved in gouty and rheumatic conſtitutions, and in ſuch people there is reaſon to ſuſpect that it is more or leſs connected with the general conſtitutional affection. This obſervation is of importance; for when an operation is performed in ſuch caſes, a total blindneſs is uſually the conſequence. Richter operated on a man who had been much troubled with gout, and his ſight was reſtored. In ſeven months afterwards the pupil gradually contracted, at laſt cloſed, and a ſecond blindneſs followed. In one caſe of a ſimilar kind on which we operated, an attack of gout ſucceeded the operation, the eye ſuppurated, and the inflammation has never altogether diſappeared, though two years have elapſed ſince the operation. Even in ſuch caſes the operation is not to be entirely forbidden: the ſucceſs is leſs certain, and the patient will require a very careful preparation before it, and much attention after it.

214 Hereditary cataract.

There are ſome varieties of cataract which are conſidered to be hereditary. Richter extracted a cataract from a man whoſe father and grandfather were both blind from that complaint. Maitre Jean and Janin have both met with ſimilar caſes. Richter alſo ſaw three children, born of the ſame parents, who had all cataracts at the age of three years. We have known ſeveral ſimilar facts, and particularly one of twins, who both were affected with cataract when one year old.

215 Cataract of the capſule.

When the cataract is ſeated in the capſule above, it in general ariſes from a blow or wound with a pointed inſtrument. Sometimes the whole anterior portion is opake and very much thickened, whilſt that which is poſterior remains tranſparent; and in ſome caſes the capſule has been extracted in the form of a bag, having become altogether opake, and containing within it the cryſtalline. Such caſes have been called by Richter the *cataracta cyſtica*. He ſays he has only met with one caſe of that form of the diſeaſe; Beer, however, mentions many; and from meeting with them he has been led to propoſe the extraction of the capſule along with the cryſtalline in all caſes of the diſeaſe.

The *cataracta membranacea primitiva* of Scarpa is alſo another form of the diſeaſe. In this variety the lens diſappears, and leaves the capſule opake, or at moſt in its interior a ſpeck not larger than a pin-head. This kind of cataract, Scarpa remarks, occurs moſt frequently in infants, or in people under twenty years of age. It may be diſtinguiſhed by its reſemblance to a very thin ſcale, or by a very white point, at the center or at the circumference of the cryſtalline.

216 Trembling cataract.

The *tremulous* cataract (*cataracte tremblante* of the French), is another variety of the diſeaſe which deſerves to be noticed. It is generally of a very opake white colour,

Of the Diſeaſes of the Eye.

colour, and ſeldom large. It moves about on every motion of the eye, and the whole iris trembles and fluctuates to and fro. Sometimes they altogether diſappear, at times paſſing behind the iris, but they ſoon regain their ſituation. In one example of this diſeaſe we obſerved that the opake lens ſometimes fell into the anterior chamber through the pupil. In this form of the diſeaſe it generally happens that the functions of the retina are impaired or loſt; though this is not always the caſe.

217 Cataract combined with amaurosis.

Cataract is often accompanied with a complete amaurosis. In ſome caſes of this kind there is a great dilatation, and immobility of the pupil, and the opake lens is obſerved of a very large ſize behind it. The patient can ſeldom diſtinguiſh light from darkneſs; and the want of ſight generally precedes any obſcurity of the lens. In ſome caſes, where there is a combination of cataract and amauroſis, the pupil remains of its natural form, and alters according to the quantity of light. But, as in the former variety of the diſeaſe the opacity of the lens moſt commonly precedes the amauroſis, it generally too comes on ſuddenly, preceded by ſparks of fire appearing before the eyes, or clouds flying before them, or headach, and pains about the brow or temples. We have ſeen an inſtance of a ſimple cataract in one eye, and in the other cataract and amauroſis combined.

Commonly cataract affects both eyes ſimultaneouſly; but there are alſo many examples of the diſeaſe affecting only one eye. It alſo happens, that firſt one eye is affected, and many years afterwards the ſecond. We have in general obſerved, that when the cataract takes place only in one eye in young people, or when it ſucceeds a blow, the other eye is ſeldom affected. But on this we ſhould not truſt much, for it is an undeniable fact, that a great ſympathy exiſts between the two eyes; and that when one of them becomes diſeaſed, the other is very apt to become ſimilarly affected. We have ſeen a caſe where a ſtaphyloma aroſe in one eye in conſequence of a wound, and in a few years afterwards the other eye became ſtaphylomatous. A man who received a blow on one eye, which produced amauroſis, had ſoon afterwards a cataract formed on the other. Richter mentions an analogous caſe. St Ives mentions a very remarkable caſe of a man who was wounded in the right eye with a ſmall ſhot, and ſhortly after that eye was affected with a cataract. Some time afterwards the ſame diſeaſe took place in the left eye, but which gradually diſappeared after the cataract had been extracted from the *right* eye. Theſe obſervations on the connection between the two eyes, have led ſome ſurgeons to adviſe operating for cataract when only one eye is affected, in order to prevent the ſecond eye from becoming diſeaſed. There are a few caſes where this practice has been ſucceſsfully adopted, and there are others where it has failed. We know of one gentleman, now upwards of ſeventy years of age, who was couched for a cataract in one eye when twenty years old, and the diſeaſe has never attacked the other eye. Richter once performed the operation on a woman who had a complete pearl-coloured cataract in the *left* eye, and an incipient one in the right, which, before the operation took place, was beginning to advance rapidly. After operating on the left eye, the progreſs of the diſeaſe in the *right* ſeemed to be checked, and for years after the operation it had not made the ſmalleſt progreſs. On the other hand, we have operated in ſeveral caſes where the diſeaſe was juſt commencing in one eye, and when the operation did not appear to arreſt its progreſs in the ſecond one. It is therefore a point not yet determined in what caſes it would be adviſable to operate when only one eye is affected; for in thoſe where the progreſs of the diſeaſe in the ſecond eye cannot be arreſted by an operation on the firſt, no operation ſhould be performed on either eye until viſion is nearly altogether deſtroyed.

218 Progreſs of the diſeaſe.

The progreſs of this diſeaſe is very various; ſometimes it proceeds ſo ſlowly as not to deſtroy viſion for many years, at other times a complete obſcurity of the lens has been known to take place almoſt inſtantaneouſly. Richter and Eſchenback both relate caſes where people labouring under gout, which ſuddenly retroceded, were entirely deprived of their ſight in one night. We have obſerved analogous caſes, though we could not determine the exiſtence of any conſtitutional affection.

From the ſound cryſtalline being chiefly compoſed of *albumen* and a ſmall quantity of *gelatine*, whatever might produce a coagulation of theſe, would deſtroy the pellucidity of the lens. Whatever too would produce inflammation of the capſule of the lens might alſo render it obſcure; for when any ſerous ſurface is inflamed, and to that claſs belongs the capſule of the lens, its tranſparency is deſtroyed, and it becomes thickened from an effuſion of albuminous matter on its ſurface. Cataracts ariſing from wounds are probably produced in this manner.

In old people there is often diſtinguiſhable a ſlight obſcurity of the lens, and ſometimes it even forms a complete cataract. In ſuch caſes the obſcurity probably ariſes from a want of balance in the ſecreting and abſorbent ſyſtems, or the neceſſary perfection of theſe functions to preſerve the natural ſtate of parts, which we obſerve to decay in many other organs, as well as the eye, in thoſe far advanced in life.

219 ymptoms remarked by the patient.

Beſides the ſymptoms which are to be obſerved in an eye affected with cataract, there are others remarked by the patient. Objects appear to him as viewed through a miſt or cloud; and as the opacity of the lens increaſes, the cloud appears greater until it finally prevents even the largeſt objects from being diſtinguiſhable.

The patient, at the commencement of the diſeaſe, can diſtinguiſh objects better in a moderate than in a bright light; and the ſame thing happens if the light be interrupted by the interpoſition of the hand or any other ſhade. The reaſon of this is obvious; becauſe the pupil is more dilated in a moderate than in a bright light, and thus ſtill admits a certain number of rays of light by means of the pellucid circle of the lens.

When the exterior part of the lens is leſs obſcured than the centre, the patient ſees thoſe objects much better which are placed by his ſide, than thoſe which are oppoſite to him.

If the obſcurity has not affected the middle of the lens, but ſome part of its edge, any circular body looked at by the patient, appears to have its edge imperfect. It has been alſo remarked that ſome patients ſee every thing with perforations in them. The cataract is ſeldom accompanied with any pain. When it is brought on from internal cauſes, both eyes are generally affected.

Of

Of the Diſeaſes of the Eye.

Of the Treatment of Cataract.

220 In the treatment of cataract, recourſe has generally been had to a ſurgical operation. Some have pretended to cure cataract by internal medicines. Small doſes of *calomel*, *electricity*, *extractum hyoſcyami*, *aqua lauroceraſi*, have been extolled; but their uſe is now very generally given up. In ſome caſes of cataract which have ariſen from an injury of the eye, Mr Ware has ſeen them diſappear by an external application of æther, which promoted the abſorption of the opaque body *.

* See his *Surgical Operations.*

There are two operations which have been propoſed for the cure of the cataract; the one called *extraction*, and the other *couching*. In the firſt, an inciſion is made into the cornea, and the lens removed by puſhing it through the pupil. In the ſecond, the lens is taken out of its capſule, and lodged in ſome part of the vitreous humour, where it may be entirely out of the axis of the eye. Each of theſe methods has been much practiſed; and though a decided preference ſeems at preſent to be given by the moſt diſtinguiſhed ſurgeons to the mode by extraction, yet there are alſo caſes attended with peculiar circumſtances, in which the operation of couching may be ſucceſsfully employed. Both operations ought therefore to be well underſtood by every ſurgeon.

221 Preparatory ſteps.

It was formerly the cuſtom, before performing either of theſe operations, to confine the patient for ſeveral weeks, or even months, to a ſtrict antiphlogiſtic regimen; but this precaution, except in very particular caſes, may be generally diſpenſed with. People who have become blind, generally lead a quiet life, and are not expoſed to any of thoſe diſſipations which are likely to affect the conſtitution. It will therefore generally be found ſufficient precaution, before attempting an operation, to enjoin the patient to live moderately; to avoid ſpirituous liquors, and take a few doſes of any of the common laxative medicines. If he be ſtrong and plethoric, it will be neceſſary to purſue ſuch a courſe a little further; to give doſes of laxative medicines for a longer period, and even to bleed the patient in the arm. Many ſurgeons lay it down as a general rule, to take ſome blood on the morning of the day of the operation, either from the arm, from the temples, or from the neck by cupping; and either of theſe methods is to be preferred, according to the quantity of blood which is intended to be taken. In old people of a healthy conſtitution, we have often found it unneceſſary to uſe any of theſe means, no inflammatory ſymptom having ariſen during the progreſs of the cure. In many caſes, inſtead of bleeding before the operation, we have preferred doing it after the operation was performed, when the patient was put quiet in bed. Blood taken at this period may be reaſonably ſuppoſed to have a more powerful effect in giving check to any inflammatory attack which might be apt to ſucceed the operation, than if an equal quantity had been taken away before it. The bleeding too, immediately after the operation, we have often obſerved, renders the patient calm, and more diſpoſed to reſt, whereas at the ſame time any of thoſe diſagreeable ſymptoms are avoided during the operation, which are apt to remain for ſeveral hours after bleeding, when the patient is in the erect poſture. It is alſo of importance before the operation is performed, the patient being ſo ſituated, that he can be eaſily put to bed. The operation ſhould therefore be performed in the ſame chamber in which he is to remain, or in one immediately adjoining; and he ſhould be clothed in a bed-gown, or ſome looſe dreſs, ſo as to enable him to get into bed without much trouble. The bed ſhould be placed in ſuch a poſition in the room that the light does not fall directly on the patient's face, ſo that during the cure, all glaring lights may be eaſily avoided.

Of the Extraction of the Cataract. 222

In this operation the object of the ſurgeon is to make a wound in the cornea, and to extract through it the opake lens. In performing it there are four ſteps which require to be particularly conſidered. The *firſt* of them is the means to be employed for ſecuring the eye during the operation. The *ſecond* is the mode of making the inciſion through the cornea; the *third*, the mode of opening the capſule of the cryſtalline lens; and the *fourth* is the extraction of the lens. All theſe ſhall be conſidered ſeparately.

Mode of ſecuring the Eye and Eyelids. 223

One of the great improvements in modern ſurgery is the ſimplicity of the mechanical means employed in performing operations. A great variety of contrivances have been propoſed, in order to ſecure the eyeball and eyelids during the extraction of the cataract. Experience, however, ſhews, that almoſt all theſe are completely uſeleſs, and moſt of them extremely hurtful. To diſpenſe, therefore, with theſe inſtruments, and to be able to execute with the fingers alone thoſe parts of the operation for which they were employed may be juſtly conſidered as a material improvement. The eyeball and eyelids may be completely ſecured in almoſt all caſes, by the fingers of one hand of the operator, and thoſe of an aſſiſtant. The aſſiſtant will generally find that, with the forefinger of one or of both hands placed upon the tarſus, one upon the internal, and another towards the external angle of the eye, he will be eaſily able to raiſe the upper eyelid, ſo as to expoſe the cornea; and by the finger being placed towards the internal angle he will be alſo able to aſſiſt the operator in preventing the eyeball from being turned inwards, when the inciſion into the cornea is about to be made. The operator is to ſecure the under eyelid by the fore and middle fingers of his left hand. They are to be placed in ſuch a manner over the edge of the tarſus, that they may come in contact with the eyeball; and the middle finger is to be preſſed pretty firmly in the internal angle of the eye, between the eyeball and lachrymal carcuncle, ſo as effectually to prevent the motion of the eye towards the noſe. In this poſition of the fingers of the operator and aſſiſtant, thoſe who are accuſtomed to perform operations on the eye, find that they are completely maſter of the motions of the eyeball; and by altering the poſitions of the points of the fingers, and applying more or leſs preſſure, they are able to counteract any untoward motion of the organ. Before attempting to ſecure the eyeball, the operator ſhould be prepared to advance in every ſtep of the operation; for it will be generally found, that if an attempt has been made to open the eyelids forcibly, a certain degree of irritation and watering of the eye takes place; ſo that, when a ſecond attempt is made, with

Of the Diſeaſes of the Eye.

with a view of proceeding to the other ſteps of the operation, more difficulty is met with in holding the eye than at firſt would have been the caſe. It is a good precaution, however, for the ſurgeon to take an opportunity, before the day of the operation, to try to fix the eye, and to explain to the patient this ſtep of the operation; for it often happens, that patients ſtart, and make great reſiſtance by ſqueezing the eyelids, when the operation comes to be performed; ſo that by habituating them to the mode of ſecuring the eye, it is more eaſily accompliſhed. The firſt thing to be attended to, before attempting to fix the eye, is a proper light, the poſition of the patient's head, and the height of the chair in which he is to ſit. The light of the room ſhould come from one window, and the patient ſit in ſuch a manner that the light falls obliquely over his noſe upon the eye to be operated on. If he be placed ſo that the rays of light from the window fall in the direct line of the eye, the ſurgeon will find that he is obliged, either to ſit in his own light, or that the reflections upon the cornea tend to embarraſs him. As ſoon as the other eye is covered, ſo as to prevent it from having any motion, and communicating that motion to the eye on which the operation is to be performed, the aſſiſtant is to be placed behind the patient, and the patient's head to be ſupported firmly on his breaſt. The height of the chair on which the patient is to be placed, will depend on the height of the patient, and always ſhould be ſo low, that the aſſiſtant is able to look over the head, and completely command the motion of his own fingers. The operator and aſſiſtant ſhould open both eyelids at the ſame time, which will more readily ſecure the eyeball in a proper poſition. The eyeball, however, is apt to be turned upwards, ſo that the cornea is thrown out of view. When this happens, the upper eyelid ſhould be firſt raiſed, and the aſſiſtant ſhould be always ready with the points of his fingers, to preſs in ſuch directions, that when the eyeball at any moment places itſelf in a proper poſition, he may be ready to ſecure it. When, on the other hand, the eyeball is thrown downwards, the operator himſelf muſt place it in a proper poſition, and in this manner both the operator and aſſiſtant are to co-operate with each other, and the one or the other placing his fingers in ſuch a manner as to counteract moſt effectually any aukward poſition of the eyeball. When the eyeball appears ſteady, the inciſion of the cornea ought to be immediately performed. But before entering the knife, it will be found a uſeful precaution to touch the cornea frequently with its back, and ſee if the patient ſtarts, or if the eyeball remains quite ſteady. It will often happen, that whenever the point of the inſtrument touches the eyeball, it is ſuddenly thrown into motion; and was the inciſion of the cornea to have been begun at this moment, much difficulty would have ariſen. If however, the eye be repeatedly touched with the knife, the ſtarting motion will ſooner or later ceaſe, and then the inciſion of the cornea may be begun with every poſſible advantage. When the knife has paſſed through both ſides of the cornea, there is no danger of any motion of the eyeball hindering the operation.

If ſometimes happens that the eye is extremely ſmall, and that it is ſunk deep in the orbit. In ſuch people the operation becomes much more difficult; and we have met with caſes, where, from theſe circumſtance it was almoſt impoſſible to ſecure the eyeball with the fingers; the room which the fingers neceſſarily take preventing the knife from being properly managed, and covering a portion of the cornea. In ſuch caſes, the ſpeculum contrived by M. Pellier will be found to be a uſeful inſtrument. See Plate DXVII. fig. 8. The ſpeculum conſiſts of a piece of ſilver wire, bent in the manner repreſented in the plate; and though in itſelf extremely ſimple, it requires a good deal of management and nicety in uſing it. The curved edge of the wire (*a*) is to be placed upon the inſide of the *ciliæ* on the horizontal plate of the tarſus; the ſkin of the upper eyelid being previouſly ſtretched upwards. The aſſiſtant is then to move the ſpeculum upwards, imitating, as it were, the natural motion of the eyelids; and, when the eyeball is ſufficiently expoſed, the ſpeculum, with the handle (*b*) reſting on the brow of the patient, is to be kept firm and ſteady in the ſame poſition. In uſing the ſpeculum, it is neceſſary to make a conſiderable preſſure on the eyeball, in order to prevent the eyelid from ſlipping from underneath the ſpeculum. At the ſame time as little preſſure ſhould be employed, as will prevent this from taking place. Many ſurgeons, in uſing the ſpeculum, place it behind the *ciliæ;* and whenever any watering of the eye takes place, from the irritation of the inſtrument, it is very apt to ſlip from the moiſture of the ſkin. In order to prevent this, we have found very material benefit from ſimply folding round the ſpeculum a thin fold of crape, which, from its roughneſs, effectually prevents the riſk of the ſpeculum ſlipping. The operator is to manage the under eyelid in the ſame manner as if the upper eyelid was covered by the fingers of an aſſiſtant; and it more particularly reſts with him to prevent the eyeball from rolling inwards, the ſpeculum merely ſerving to ſupport the upper eyelid.

After the knife has penetrated both ſides of the cornea, the aſſiſtant is to be aware that no preſſure is to be made upon the eyeball. When, therefore, this ſtep of the operation is completed, the aſſiſtant, if he be uſing the ſpeculum, is to be particularly careful in taking off any preſſure which it may make, and merely to ſupport the eyelid.

Mode of making the Inciſion of the Cornea. 224

The great object to be kept in view in making an inciſion of the cornea is, that it be of ſufficient ſize to allow the eaſy extraction of the cryſtalline lens, and that any cicatrix which may remain may not interrupt the entrance of the rays of light through the pupil. The mode which has been recommended to effect theſe purpoſes, is to make a ſemicircular inciſion, parallel to the circumference of the cornea, and about half a line diſtant from the junction of the cornea and ſclerotic coat. One of the knives (Plate DXVII. fig. 1, 2, 3.) is to puncture the cornea half a line diſtant from its circumference, to be carried acroſs the anterior chamber to the oppoſite ſide, and brought through the cornea at the ſame diſtance from the ſclerotic coat to where it was entered; afterwards the inciſion is to be finiſhed by puſhing the knife forwards till the inciſion is completed.

Inſtead of making the inciſion in this manner, Mr James Wardrop has propoſed another form of inciſion, in order to remove ſeveral objections to which the other operation was liable*. The diſadvantages which Mr Wardrop

* See *Edinburgh Medical and Chirurgical Journal*, vol. iv.

Of the Diſeaſes of the Eye.

drop ſuppoſes to ariſe from the uſual mode recommended are,

1. The cornea being of very conſiderable thickneſs, a great part of the ſemicircular inciſion will be carried through between its laminæ, and therefore the length of the inciſion of the internal lamina will be much leſs than that of the external one. This he explains by two plans, Plate DXVII. fig. 11. and 12. where beſides the external form of the inciſion (*aaa*), there is drawn a ſecond line (*b*), intended to repreſent the inciſion of the internal lamina. The dark ſpace, therefore, included between theſe two lines (*b* and *a*) is intended to repreſent that portion of the inciſion which is made between the laminæ.

2. The external form deceives us in the extent of the internal inciſion, and much more difficulty is met with in bringing the lens through it, than from its apparent length could have been expected; for, as the line of the internal inciſion has a very ſlight curvature, the thickneſs and tenſion of the cornea allow the edges of the wound from being ſeparated only a little way from one another.

3. When the cornea is divided nearly at its union with the ſclerotic coat, and when the aqueous humour and lens have eſcaped, the portion of the iris oppoſite to the centre, and moſt depending part of the wound, loſes its natural ſupport given to it by the cornea, and is puſhed forward, ſo that it comes in contact with the cornea, and even inſinuates itſelf between the edges of the inciſion. The greater the opening is, the more danger there is of a prolapſus, both of the iris and vitreous humour; for it would ſeem as if theſe two parts of the eye were puſhed forwards in conſequence of the contraction of the coats of the eye, which takes place as ſoon as the inciſion is made; and if two thirds of the cornea be cut, there is certainly much leſs reſiſtance than when the half only has been divided. Thus, the iris and cornea form permanent adheſions in conſequence of the inflammation which always follows the operation. The pupil becomes of an irregular form, is drawn from the centre of the eyeball; is ſometimes very much contracted, and retains but a very limited ſphere of contraction and dilatation.

4. The contraction of the muſcles of the globe of the eye preſſing forward the contents of the poſterior chamber, are very apt to puſh a portion of the vitreous humour through the pupil and wound of the cornea. When this happens, the pupil becomes irregular, and drawn down towards the inciſion, the form of the eyeball is ſomewhat altered, and the prolapſed vitreous humour incloſed in its capſule, appears externally in the form of a round tranſparent tumor.

5. As the external edge of the ſemicircular flap of the cornea is very thin, and lies looſe, the ſmalleſt movement of the eyelids, particularly of the upper one, is apt to catch and raiſe it out of its proper ſituation, and thus that ſpeedy union is prevented which would take place if the two divided ſurfaces had been kept in accurate and conſtant contact.

6. and laſtly; As the internal edge of the inciſion is often unavoidably made, from the ſmallneſs of the anterior chamber, and the flatneſs of the cornea, nearly oppoſite to the inferior margin of the pupil; and as all the extent of the cut ſurface *a b* (Plate DXVII. fig. 12.), ſometimes remains opaque after the wound is healed, the opacity of the cicatrix muſt diminiſh the ſphere of viſion.

All theſe diſadvantages in the uſual mode of making an inciſion of the cornea, appeared to Mr Wardrop to ariſe chiefly from the want of a ſufficient portion of the cornea being left at the inferior part of the wound, to ſupport the iris, and to prevent the preſſure of the parts contained within the eyeball, and the occaſional action of the muſcles puſhing forward the iris towards the wound of the cornea; he therefore conceived that if the inciſion could be made in ſuch a manner that a larger portion of the cornea could be left at the inferior part of the wound, being at the ſame time made of ſuch a form as to allow the eaſy extraction of the cataract, and the cicatrix not afterwards to interfere with viſion, a conſiderable improvement would be made in the operation. With this view he made the inciſion in the following manner.

225 Of the cornea knife.

The beſt knife for the purpoſe is of the ſame ſize and ſhape with that delineated in Plate DXVII. fig. 1. The blade is of a ſimple triangular form, the back being one continued line with the handle, except merely the point. The point, though extremely ſharp, ſhould be made firm, and the blade ſhould turn gradually thicker from the point towards the handle. The point of the knife muſt be ſharp on both edges for at leaſt the breadth of a line, in order that it may penetrate the cornea quickly and eaſily. The back of the knife ſhould not be left angular, but the edges rounded off and made ſmooth, ſo that it be convex on both ſides. Particular care ought to be taken that the point of the knife be well conditioned; and it is not only neceſſary that it be ſharp, but that the metal of which it is made be neither too hard nor too ſoft. This may be eaſily aſcertained by preſſing the point upon the nail; for if it bend readily, not being ſo brittle as to break through, and ſufficiently elaſtic to recover the ſtraight line, we may be confident that it will anſwer the purpoſe. It is alſo a good precaution to have the knife ſharpened the day before, or the morning of the operation; and in caſe of any accident happening to the point, the operator himſelf ſhould carefully examine by trying how it penetrates a thin piece of leather, immediately before uſing it. From the point of the knife being too brittle, we have known a caſe where the point of it was broken off, when attempting to penetrate the inner part of the cornea; and from the point being too ſoft, we in one caſe, after puncturing the cornea, found it impoſſible to penetrate with the knife the oppoſite ſide, and this we found had ariſen from the point of the knife bending round.

Having previouſly ſmeared the knife with oil, or ſmoothed the edge of it upon the palm of the hand, in order to make it cut more keenly, its point is to be thruſt through the cornea at its tranſverſe diameter, and at leaſt half a line diſtant from the ſclerotic coat, and in a direction as if it was to wound the iris, or nearly perpendicular to the ſpherical ſurface of the cornea (ſee Plate DXVII. fig. 13. and 15. *a*). When the point of the knife reaches the plane of the iris, it is to be turned towards the oppoſite ſide of the cornea, by moving the blade upon the inciſion already made, as a fulcrum. It is then to be carried forward, ſo that the cornea is again punctured at its tranſverſe diameter *b*, at the ſame diſtance from the ſclerotic coat at which it had been entered on the

Of the Diſeaſes of the Eye.

226

Of the inciſion of the cornea.

the oppoſite ſide (fig. 13.). By theſe two inciſions the blade of the knife has cut perpendicularly, or very nearly ſo, to the ſpherical ſurface of the cornea, and the gradual thickening of the knife, by filling up the wound as faſt as it is made, prevents any of the aqueous humour from making its eſcape. The eye is now completely ſecured with the knife, and the aſſiſtant who has been ſupporting the upper eyelid, ſhould receive a ſignal from the operator, to take away all preſſure from the eyeball, and merely to ſupport the eyelid ſufficiently to allow the inferior half of the cornea to be ſeen. When the knife has been puſhed forward a little way, as is repreſented in fig. 15. the inciſion is to be finiſhed, by turning round the blade on its axis, and thus keeping the edge turned outwards, in ſuch a manner, that the remaining part of the inciſion is made a ſtraight line, and therefore nearly perpendicular to the lamellæ of the cornea (fig. 13. *c*). Whenever the laſt ſtep of the operation is begun, the aqueous humour begins to eſcape, which allows the knife to cut the cornea readily and in any direction.

Suppoſing, therefore, that the cornea, inſtead of being ſpherical, were a plain ſurface, the inciſion now deſcribed would be repreſented by the lines *a*, *b*, and *c*, fig. 13.; but as it is a ſegment of a ſphere, the form will more reſemble that repreſented in fig. 14.; at leaſt this is the form of the inciſion which the operator ſhould have in view when performing the operation. By the inſpection of theſe figures (13 and 14), it appears,

1. That a large portion or ring of the cornea is left attached to the ſclerotic coat, and muſt form, from its thickneſs, a complete ſupport to the iris.

2. That as the inciſion is made throughout nearly perpendicular to the lamellæ of the cornea, the length of the inciſion of the internal lamella will be nearly equal to that of the external one, and will be greater than when it is made in the uſual manner, by the ſemicircular inciſion; and conſequently the cataract will be more eaſily extracted through it.

3. The upper edge of the internal inciſion is at a greater diſtance from, or further below the edge of the pupil.

4. As the flap of the cornea is very ſmall, the external edge thick, and not eaſily moveable, or apt to be caught by the motion of the eyelids, the edges of the inciſion are not liable to be diſplaced, and conſequently the wound has a much better chance of uniting by adheſion.

Laſtly, the cicatrix which remains is ſcarcely perceptible, and cannot even be diſtinguiſhed when the cornea is looked upon in a direction perpendicular to its ſurface. The inciſion ſhould be made ſo that the inferior edge of the wound (fig. 3. *c*) is half way between the circumference of the cornea and the edge of the pupil, ſuppoſing the pupil to be in a moderate ſtate of dilatation. If it be made nearer to the ſclerotic coat, then the advantages to be expected from this mode of operating will be loſt; and on the other hand, if it be made at too great a diſtance from the ſclerotic coat, and conſequently too near the pupil, the edge of the pupil will be apt to paſs through between the lips of the wound. In one caſe in which this accident happened, partly on account of the inciſion being at too great a diſtance from the ſclerotic coat, and alſo from the knife having been entered too far above the tranſverſe diameter of the cornea, the wound was long in uniting, and after it was healed, the pupil remained very irregular and contracted.

Of the Diſeaſes of the Eye.

In making the inciſion of the cornea in the manner that has been directed, another circumſtance alſo particularly deſerves notice, which is, that after having punctured both ſides of the cornea, in giving the knife the motion round its axis, ſome of the aqueous humour eſcapes, and there is a great riſk of the iris turning over the cutting edge of the knife. An operator who meets with this for the firſt time, is apt to think an wound of the iris is inevitable; but if he cautiouſly ſtops the progreſs of the knife by gliding the point of the forefinger over the cornea, and preſſing the iris from its edge, the inciſion will be completed with perfect ſafety.

It ſometimes happens that after the knife has entered the cornea, the eyeball makes a ſudden motion inwards, towards the noſe, and a conſiderable part of the cornea is thus thrown out of view. This accident happens either from a fault in the operator or his aſſiſtant, and ought to be particularly guarded againſt; for when it has taken place, it is irremediable. The operator muſt not attempt to proceed any further, but immediately withdraw the knife, allow the wound of the cornea to heal, the aqueous humour to be regenerated, and after any ſlight inflammation which might ſucceed, has gone off, the operation may be a ſecond time attempted without any additional riſk.

It ſometimes happens that, on puncturing the cornea on the naſal ſide, the point of the knife does not come through at the proper diſtance from the ſclerotic coat. If it paſs through too near the centre of the cornea, as is repreſented in Plate DXVII. fig. 17. conſiderable diſadvantage ariſes; for beſides the inciſion being too ſmall, ſo that the lens is extracted with difficulty, the eye is apt to receive conſiderable injury, and the cicatrix afterwards to interfere with viſion. When this accident happens, it will be the moſt prudent practice to proceed no further in the operation, but to allow the wound to heal by adheſion, ſo that a ſecond operation might be afterwards attempted with all the advantages of the firſt. It is aſtoniſhing the rapidity with which a wound of the cornea made by a cutting inſtrument heals, and except it be very large, ſcarcely can the moſt acute eye detect any cicatrix. It is therefore much more prudent whenever any fault in the inciſion ariſes, that the wound be allowed to reunite, ſo that afterwards a ſecond operation may be ſucceſsfully performed, inſtead of attempting by ſciſſars or other inſtruments to correct any bungling. If the knife paſſes through the cornea too cloſe to the ſclerotic coat, it is not attended with ſuch bad effects as when it paſſes near to the pupil; and was it not for the danger in wounding the iris, it would be adviſable in all caſes to lay it down as a general rule to make the knife come out very cloſe to the ſclerotic coat. See fig. 18.

227

Of the Mode of opening the Capſule of the Lens.

After the operator has completed the inciſion of the cornea, he ſhould make a pauſe, and allow the patient to compoſe himſelf a little, in caſe of any involuntary motion of the eye-ball injuring any part of its ſtructure. It ſometimes happens, indeed, that the moment the inciſion of the cornea is finiſhed, the lens ſuddenly follows the knife; but this is a circumſtance never to be wiſhed for, as the ſame cauſe which throws out the lens may

alſo

alſo puſh after it ſome of the vitreous humour. When the inciſion of the cornea is finiſhed, and nothing has eſcaped but the aqueous humour, the patient ſhould be directed to turn his eye from the light, and to keep his eyelids ſhut, taking great care not to ſqueeze them, ſo that the pupil may be allowed to dilate. In moſt ſurgical operations, particularly thoſe attended with much pain, it is of importance to finiſh them as quickly as poſſible. This, however, is not the caſe in the extraction of the cataract. It will be in general found that the ſeverity of an injury done to any part of the body depends, not only on its extent, but on the ſudden manner in which it is inflicted. Thus, a ſmall drop of blood ſuddenly effuſed on the ſurface of the brain, often produces a ſeries of much more diſtreſſing ſymptoms than a large collection of purulent matter in that organ. It is therefore reaſonable to expect that if the different ſteps of the operation for the extraction of the cataract are gone through in a rapid manner, the eye will be much more injured than if the ſame operation be performed more ſlowly. There is another advantage too, derived from performing the operation in a cautious manner; by holding the eye firmly for ſome time, the muſcles become fatigued, and during the latter ſteps of the operation, when there is the greateſt danger of injuring the organ, the power of reſiſtance to the operator is much diminiſhed.

228 Mode of puncturing the capſule.

The next ſtep of the operation is to make a puncture in the capſule of the cryſtalline lens, ſo that the lens is allowed to paſs through the pupil. On opening the eyelids, it will generally be found that the pupil has a very irregular appearance, which a beginner may often ſuppoſe to be in conſequence of a wound of the iris, though no ſuch accident has happened. Some ſurgeons employ an aſſiſtant to ſupport the upper eyelid, whilſt others take both eyelids completely under their own management; and when the operator finds that he can eaſily accompliſh this laſt mode, he ſhould always prefer doing ſo. When the eyelids are opened in ſuch a manner as to expoſe the inciſion of the cornea and pupil, the point of the inſtrument called the *curette* *, is to be introduced through the wound of the cornea and pupil, to puncture the capſule of the lens. Richter adviſes that the capſule ſhould be punctured ſeveral times with the point of this inſtrument, in order that a large opening may be made into it. When the lens is ſoft and milky, this may be neceſſary, but when it is of a firmer texture, if one puncture is made it ſufficiently tears the capſule ſo as to allow itſelf to come away eaſily. Before introducing the *curette*, moderate preſſure ſhould be made on the eyeball, which has the effect not only of keeping the eye ſteady, but alſo of dilating the pupil. The convex part of the inſtrument (*a*) is then to be introduced through the wound of the cornea, and conducted to the central part of the pupil. When it reaches the pupil, from the curvature of the inſtrument, a very ſmall turn of the handle will place the point upon the capſule of the cryſtalline lens, and by puſhing the point inwards, the capſule will be readily punctured. It is not neceſſary that the point of this inſtrument be very thin; a rounded point will anſwer all the purpoſes of puncturing the capſule; whilſt from this form there will be leſs danger of wounding the iris from any unexpected motion of the eyeball. Very little force is neceſſary to puncture the capſule, and when the point of the curette paſſes through it, it gives the ſenſation as if puncturing a piece of very fine paper with a pin.

* See Plate DXVII. Fig. 19.

This part of the operation we have often found to be one of the moſt difficult; for in many patients the eye becomes extremely unſteady, and whenever an attempt is made to hold it firm, or introduce the point of the curette, the eyeball is immediately rolled upwards under the roof of the orbit. The eyeball, too, is apt to make ſome untoward motion, after the point of the curette has been introduced into the anterior chamber; ſo that if the operator be not on his guard, the iris may be caught and torn by the point of the curette. In one caſe where, after the point of the curette was introduced through the pupil, the eye turned ſuddenly upwards, and the hooked part of the inſtrument catching the edge of the iris, pulled it a good way downwards, though fortunately it did not tear it.

Mode of Extracting the Lens.

229

Whenever the capſule of the lens is punctured, the lens in many caſes begins to move forward, and the pupil to dilate. The operator carefully watching this effect, ſhould keep up an equal and moderate preſſure upon the eyeball, which will aſſiſt the lens in getting through the pupil. Whilſt the lens is making its eſcape, and appears to preſs very much on the inferior part of the pupil, the iris ſhould be ſupported by the back of the ſpoon, (*b* Plate DXVII. fig. 19.) which is generally for conveniency, fixed upon the oppoſite end of the handle of the curette. In applying the preſſure on the eyeball, it is of great importance that it be kept up uniformly, and it ſhould always be proportioned to the effects which it appears to produce on the dilatation of the pupil. In moſt caſes a very moderate preſſure will be found to anſwer the purpoſe. We have met with others, however, where it was neceſſary to compreſs the eye with a good deal of force, before it was poſſible to remove the lens.

Any ſmall portion of opaque lens which now remains in the capſule, or on its ſurface, muſt be extracted by means of a ſmall ſcoop. When the fragment lies on the ſurface of the capſule, or in any part of the anterior chamber, it is in general eaſily removed; but when the opaque body remains within the capſule, it becomes neceſſary, that the ſcoop ſhould enter the capſule through the opening which was made in it. When this opening is large and wide, the ſcoop will eaſily get in, and reach the opaque fragment; but on the contrary, when the opening is ſmall, the ſcoop may be moved about in every direction, in hopes of laying hold of it, for the ſcoop is on the outſide of the capſule, and cannot procure an entrance. It has happened accordingly, that every endeavour to extract the remaining fragment has been fruitleſs, and in ſuch caſes it was ſuppoſed by the operator to adhere to the capſule. It was more probable, however, that the capſule had not been ſufficiently opened, and that the ſcoop could not reach the ſmall fragments. In all caſes, however, it is an object of importance, completely to remove the opaque body; for though any remaining portions be ultimately abſorbed, yet in the mean time the operation is by no means ſo complete as it would have been, had nothing been allowed to remain. It has been adviſed by ſome, (and the practice has certainly been attended with

with good effects), that after the principal part of the lens is removed, any fragments which may remain, and which are not viſible, may be brought into view by ſhutting the eyelids, and cautiouſly rubbing them with the finger.

230 *Of the Extraction of the Capſule.*

When, after the cryſtalline lens is removed, the capſule is found to be opaque, it is abſolutely neceſſary that it be at the ſame time taken away. Opacities of the capſule are generally ſituated in its anterior parts, which renders the removal of them much more practicable. The forceps for this purpoſe (Plate DXVII. fig. 9.) are to be cautiouſly introduced through the wound of the cornea and pupil, and any opaque portion laid hold of, and cautiouſly removed. It has been obſerved that though the capſule did not appear opaque during the operation, yet in conſequence of inflammation, which occurs more or leſs afterwards, the capſule has become opaque. This circumſtance has led to a propoſal, that in all caſes the capſule ſhould be extracted along with the opaque lens. From the natural ſtructure of the eye, and the ſtrong adheſion which exiſts between the poſterior part of the capſule of the lens and the anterior portion of the capſule of the vitreous humour, it would appear impracticable to ſeparate them from each other, ſo as to extract the capſule entire. Many caſes, however, are recorded by different authors, where, in performing the common operation, the lens incloſed in its capſule has made its eſcape. In theſe caſes, however, it is probable, that the natural adheſion between the capſules of the two humours had been deſtroyed by ſome morbid alteration of ſtructure. Such caſes have probably been the cauſe of the propoſal to extract in all caſes the capſule of the lens. Mr Beer, a celebrated oculiſt in Vienna, has publiſhed a work*, in order to recommend and deſcribe the mode in which ſuch an operation ſhould be performed. After ſome general obſervations on the bad conſequences which ariſe from portions of the capſule remaining behind after the lens is removed, he deſcribes his mode of operating in the following words.

*Practiſche Beobachtungen.

"Immediately after dividing the cornea, I dilate the pupil as much as poſſible, by a gentle preſſure on the eyeball with the finger. I then introduce the lancet (Plate DXVII. fig. 4.) through the wound of the cornea, and plunge it into the lens; one ſurface being turned upwards, and the other downwards, ſo that none of the lancet is viſible. It is particularly to be recommended to the inſtrument-maker, that this lancet have a pretty thick body, by which means, the moment of introducing it, the lens will be ſomewhat preſſed back, and its weak anterior adheſion will be ſeparated. The lancet muſt now, when in the middle of the lens, be moved upwards and downwards, in order to divide its connections above and below. Laſtly, the inſtrument muſt be turned ſuddenly on its axis, and moved to the inner angle of the eye, and then drawn out in a ſtraight direction. The lens often follows with its capſule, immediately after the lancet is withdrawn, or at leaſt it comes out quite eaſily, along with its capſules, on a continued preſſure of the finger. There is not merely a ſleight of hand, which muſt be carefully obſerved in the uſe of the lancet; experience has taught me many precautions which muſt not be neglected the moment that the lens comes out, otherwiſe the capſule may be very eaſily rubbed off from the lens, either in paſſing the pupil, or in the wound of the cornea.

"In order to avoid this, the opening of the cornea ſhould be made as large as poſſible, and it is beſt to divide two-thirds of it; thereby the operator has the following advantages.

"1. The pupil dilates of itſelf after the diviſion of the cornea by the preſſing forward of the lens; and this dilatation may be eaſily increaſed by the ſlighteſt preſſure.

"2. The more the pupil is dilated, the better the operator can obſerve the management of the lancet; he can move his inſtrument more freely in different directions in the lens, and conſequently ſeparate more quickly and more ſurely, the lens along with the capſule, from all its connections.

"3. The lens with its capſule paſſes more eaſily through the pupil, the wider the opening in the cornea, (which indeed requires in moſt caſes much ſpace), and the further and more eaſily the pupil dilates, the leſs danger there is of the capſule being ſeparated on coming out. If the wound of the cornea is ſmall, the capſule will be either ſeparated from the lens in the pupil, or in the wound of the cornea, or paſſed back again either entirely, or at leaſt partly, into the poſterior chamber of the eye."

To thoſe who are accuſtomed to perform operations on the eye, the method which we have detailed will at once appear to be difficult, extremely dangerous, and in many caſes totally impracticable. The cauſes of failure in the operation for the cataract ſeldom ariſe from an opacity of the capſule of the lens, and when this does occur, it is always in conſequence of a violent or long-continued inflammation of the eyeball. Whenever, therefore, the inflammation which takes place after the operation is checked by proper remedies, a cataract of the capſule will ſeldom be met with.

Of the Treatment after the Operation. 231

After the lens has been extracted, and the eyelids allowed to remain ſhut for a ſhort time, the eye ought to be examined, in order to aſcertain that the edges of the wound of the cornea are in their proper place; that no portion of the iris has paſſed through it, and the pupil is quite regular. When the inciſion of the cornea is made in the manner and ſize already deſcribed, the edges of the wound, from their firmneſs and thickneſs, accurately apply themſelves to each other; and if the iris has ſuſtained no injury, it will remain in its natural ſituation, and the pupil will become perfectly circular. When the pupil is not regular, it has been generally recommended to expoſe the eye to a bright light, in order to make it contract, and thus detach it from any part to which it might have adhered. When a portion of the iris protrudes through the wound, this generally ariſes, not from any injury of that part, but in conſequence of the inciſion of the cornea having been made too large. If the inciſion be more than ſemicircular, (or two-thirds of the circumference of the cornea as directed by Mr Beer) this accident will almoſt conſtantly happen; and when it does take place, can never, as far as we know, be remedied. In ſuch caſes the operator ſhould be careful not even to attempt with the ſpoon, or any ſuch inſtrument, to replace the prolapſed iris; for it has always

Of the Diſeaſes of the Eye.

been obſerved, that attempts of this kind are fruitleſs, and never fail to increaſe the inflammation which ſucceeds the operation.

In applying the neceſſary compreſſes and bandages on the eye, the objects to be held in view are, to keep the eyelids in ſuch a poſition, that they cannot diſturb the wound of the cornea by their motion, and that the eye be not expoſed to any light. The upper eyelid will be completely ſecured, by placing over it, and in the hollow of the orbit, a ſmall ſtripe of wet caddis. The piece of caddis ſhould not be ſo large as to preſs much upon the eye, and from its being wet, it will be readily kept in its ſituation. Above the caddis ſhould be placed a piece of linen covered with ſimple ointment, large enough to cover both eyes; and this may be ſecured by one turn of a bandage round the head. In applying the bandage, care ſhould be taken to place it ſo that the pins are put in at the forehead and temples. The conveniency of this will be afterwards found, the bandage being eaſily removed without moving the patient's head from the pillow. The patient ſhould now be put cautiouſly to bed, and his head kept extremely low. The room in which he ſleeps ſhould be made ſo dark, that no light may paſs through the bandage to the eye. In an hour or half an hour after the operation, after the patient has become compoſed, he ſhould be bled in the arm, if from the previous ſtate of the patient's health that ſhould be deemed a proper precaution. Reſt, quietneſs, and abſtinence, ought to be rigidly adhered to for the firſt day after the operation; the patient ſhould be allowed no food except that which is liquid, in order that any motions of the jaw may be avoided, and the food ſhould be given through a tea-pot, in order to prevent any motion of the head. Sixteen or twenty hours are ſufficient to produce an adheſion of the cornea in favourable caſes; and after this period, the compreſs of wet caddis placed upon the upper eyelid, becomes no longer neceſſary; for if it be allowed to remain any longer, it becomes hard and dry, and will be apt to irritate. The bandage and plaſter ought therefore to be looſened, and the piece of caddis removed. The eyelids will now be found to adhere, and the patient will find much relief by cautiouſly wetting the ciliæ with cold water, in order to liberate the eyelids. From this period it is adviſeable to keep the eyelaſhes conſtantly greaſy with any unctuous application.

In all caſes, the ſymptoms which we are particularly to guard againſt after this operation, are thoſe of inflammation; for when theſe ariſe, various effects may be produced which might fruſtrate all our endeavours to reſtore the patient's ſight. If the wound in the cornea, inſtead of uniting by adheſion, goes through a tedious proceſs of ſuppuration, the pupil becomes irregular and contracted; or if there is an effuſion of lymph in the pupil, or if an opacity of the capſule takes place, theſe effects, all of which may ariſe in conſequence of inflammation, might either greatly impair, or entirely deſtroy viſion. The patient, therefore, ought to be carefully watched every ſix or eight hours for ſeveral days, and on the evening of the day of the operation, or at any future period, if ſymptoms ariſe which indicate the commencement of inflammation, he ought to be freely bled. The ſymptoms which are to guide us in adopting ſuch means, are pain and uneaſineſs darting through the eye or head, and a frequent and full pulſe. We have often remarked, after this operation, that even in thoſe caſes where no bleeding is neceſſary, the pulſe becomes unuſually full. This ſymptom alone would not, therefore, be ſufficient to warrant us in proceeding far in adopting ſuch a practice. We have long believed, that the ſucceſs of all ſurgical operations depends much on the adoption of the means to prevent any inflammatory action. It is well known the danger of amputation, and ſuch operations in a vigorous and healthy conſtitution; it is equally well known the ſpeedy recovery of patients from operations, who have been much debilitated from previous diſeaſe; and we have repeatedly remarked that patients who have loſt much blood from ſome accident, after an operation, have recovered much more ſpeedily than thoſe to whom no ſuch accident had happened. Aware of theſe circumſtances, we have invariably adopted rigorouſly the depletive ſyſtem after the operation for the cataract; and in many of thoſe patients from whom a very conſiderable quantity of blood has at different periods been taken, we have obſerved that the ſucceſs of the operation has been more ſpeedy and more complete. The ſurgeon will ſometimes find caſes where, from the mildneſs of the ſymptoms, he is led to heſitate on the propriety of bleeding. In ſuch a ſituation it is the ſafeſt plan to have recourſe to it; for in general, wherever no ſymptoms have ariſen which may indicate the impropriety of ſuch a practice, if it be not uſeful, it is at leaſt never followed by any bad conſequences.

Veneſection at the arm is the eaſieſt and beſt mode of extracting the blood; but ſhould any circumſtances occur which render the operation at this place impracticable, or ſhould it be thought neceſſary to take away the blood nearer to the inflamed organ, an opening may be made in the temporal artery. For the firſt two or three nights after the operation, the patient's arms ſhould be watched, or ſecured in ſuch a manner, that when he is aſleep, he ſhall not be able to raiſe his hand towards his eye; for the moſt gentle ſtroke upon the eye, even ſeveral days after this operation, is attended with moſt excruciating pain, and is generally ſucceeded by violent inflammation. The patient ſhould be enjoined to lie on his back, or on the ſound ſide of the head; and after the firſt twelve hours he may be allowed to raiſe his head to the uſual height. Moſt authors who have laid down rules to be followed after this operation, have directed that the eye ſhould be kept ſhut up, and in total darkneſs for many days after the operation. We have, however, found an oppoſite practice attended with the moſt beneficial effects, and we have always conſidered it as a general principle to be followed, that the eye, from the very day after the operation, be gradually reſtored to its natural ſtate, that the globe of the eye and eyelids be allowed to move, and that day after day the quantity of light to which it is expoſed be gradually increaſed. In regulating the quantity of light, and the motion of the eye and eyelids, we ſhould be entirely guided by the patient's feelings. Whatever be the quantity of light to which the eye is expoſed, or its extent of motion, if it does not create uneaſineſs or pain, it will never be found to prove injurious; but on the contrary, if ſuch a quantity of light be admitted as to create uneaſineſs, or if any motion of the eyes or eyelids gives pain, theſe circumſtances will all tend to increaſe the inflammatory ſymptoms.

It

Of the Diſeaſes of the Eye.

It has been already mentioned, that on the firſt day after the operation, the wet caddis ſhould be removed, and the eyelids ſeparated and covered with ſome unctuous ſubſtance, ſo that the patient may, from time to time, cautiouſly move the eyelids, provided it gives him no uneaſineſs. The pledget of ointment covering the eyes will prevent, during this day, any light from entering.

On the ſecond day the pledget of ointment may be removed, and both eyes covered with two or three folds of old linen, the patient being directed to bathe his eye frequently with a little warm water, ſo as to remove any glutinous or concreted matter from the eyelids. He ſhould alſo continue frequently to move the eyelids, and by opening them, to expoſe the eye to the ſmall quantity of light which paſſes through the linen. On the following days, the light is to be admitted more and more freely into the room, and by degrees the patient will find that he is able to look down upon the bed clothes, or any large object, without uneaſineſs. People are often apt, from the joy which they feel in having their ſight reſtored, to make too much uſe of the eye, and to render it weak and painful. Too much care, however, cannot be taken, to avoid any accident of this kind; and though the patient may feel his eye perfectly eaſy, and has no other complaint, yet it is always prudent to confine him to his bed for the firſt ſix or eight days. After the ſecond or third day he may raiſe the head or body ſafely in bed; but we have repeatedly obſerved that when patients began to ſit up early, and particularly when they approached too near a fire, they have been ſeized with a peculiar headach and inflammation of the eye, which were attended with much diſtreſs, and very difficult to remove. In ten or twelve days after the operation, the patient is commonly able to uſe the eye with conſiderable freedom, and to look even at minute objects without pain or uneaſineſs. It ſometimes happens that after this period, a ſlight irritability of the eye remains, but this in general is ſpeedily removed by the uſe of the vinous tincture of opium, or ſometimes by the application of a weak ointment compoſed of the red oxide of mercury. The application of the vinous tincture of opium will be found peculiarly uſeful; and we have known many inſtances of patients who have undergone this operation, who were frequently, for a long time afterwards, attacked with ſlight pain or inflammation of the eye, which were always ſpeedily and completely removed by the uſe of this medicine. It is ſcarcely neceſſary to obſerve that during the whole of the after treatment, the antiphlogiſtic regimen ſhould be rigidly purſued, and that the patient ſhould avoid every kind of food which from experience he knows to be apt to diſagree with him; and that above all he ſhould abſtain from the uſe of wine and ſpirituous liquors of every deſcription.

232 *Of Couching.*

By this operation the lens is depreſſed from its natural ſituation behind the pupil, by introducing a needle into the poſterior chamber.

The operation may be performed by introducing a needle (Plate DXVII. fig. 20.) through the ſclerotic coat, about two lines diſtant from its junction with the cornea. The point of the needle is to be directed immediately over the opaque lens, and the lens to be depreſſed a little with the convex ſurface of the end of the needle. The point is to be puſhed in a tranſverſe direction as far as the inner edge of the lens. Then the operator is to incline the handle of the inſtrument towards himſelf, by which means its point will be directed through the capſule into the ſubſtance of the opaque lens, and by inclining the needle downward and backward, the former will be lacerated and conveyed with the latter deeply into the vitreous humour. The treatment to be employed after couching is ſimilar to that after extraction.

Of the Diſeaſes of the Eye

Sect XI. *Of the Fiſtula Lacrymalis.* 233

When the lacrymal ſac is diſtended with a puriform fluid, or when it has ulcerated, and the tears do not paſs freely down the naſal duct, the diſeaſe is called *fiſtula lacrymalis*. In the firſt ſtage of the diſeaſe, a diſtinct tumor is formed in the ſituation of the ſac, which, when compreſſed, a quantity of puriform fluid flows upon the eyeball through the puncture, or ſome of it paſſes through the noſe. In the ſecond ſtage of the diſeaſe, the integuments covering the ſac ulcerate, and the puriform fluid and tears are conſtantly oozing through the fiſtulous opening. The eyelids are affected moſt commonly in the ſecond ſtage of the diſeaſe, and ſometimes alſo in the firſt, though not always. From the affection of the internal palpebral membrane, Scarpa has ſuppoſed that all the puriform fluid contained in the ſac was ſecreted by it, but this does not always happen.

Treatment.—When the diſeaſe has originated in the mucous membrane of the eyelids, applications to it alone will be ſufficient to remove the accumulation in the ſac. A collyrium of the muriate of mercury, and the daily application of the ointment of Janin, or of an ointment compoſed of the red oxide of mercury, are well ſuited for this purpoſe. When the ſac has been the original ſeat of the diſeaſe, a ſolution of corroſive ſublimate, acetite of zinc or of lead, will be uſeful, and theſe may be uſed by allowing them to be abſorbed by the puncta into the ſac, along with the tears, or by injecting them into the puncta by a proper ſyringe, (ſee Plate DXVII. fig. 23.).

If there be a complete obſtruction in the naſal duct, theſe remedies generally fail, and it becomes neceſſary to open the ſac, and remove the cauſe of obſtruction in the duct. The ſac may be readily opened by boldly plunging a common lancet into it while diſtended with matter. The ſac ſhould then be examined with a probe, and the probe paſſed down into the noſe in the direction of the natural canal. A ſurgeon well acquainted with the ſituation and direction of the duct, can never fail in introducing the probe; for we never met with any caſe where the obſtruction could not be overcome. A ſtyle, (Plate DXVII. fig. 24.) ſuch as has been recommended by Mr Ware, is to be introduced in place of the probe, and allowed to remain until the canal is quite open. When the parts around the ſac appear healthy, the ſtyle may be withdrawn, and the opening of the ſac then heals. In many caſes the diſeaſe returns, and in ſuch, after the parts are a ſecond time healthy, a tube (Plate DXVII. fig. 25.) may be introduced and allowed to remain during life. This operation requires that there be a free external opening, and that the head of the tube be preſſed completely down

down below the edge of the ſkin. Generally the external opening heals in a few days. When the ſac has ulcerated, there will generally be found ſome ſinuſes in the integuments covering the ſac, all which ſhould be freely laid open, and the ſtyle introduced as in the former caſe. After the ſkin and ſac are apparently healthy, the tube may be introduced as in the former caſe. Beſides the uſe of the ſtyle, it is alſo requiſite to apply the eye-waters and ointments recommended in the firſt ſtages of the diſeaſe.

234 SECT. XII. *Of the Pſorophthalmia.*

In this diſeaſe there are numerous ſmall brown coloured eminences formed at the roots of the ciliæ of both eyelids, and generally both eyes are affected. The adjacent ſkin has a brownifh red tinge, and becomes ſcurfy; the ciliæ drop out, and the patient has a difficulty and uneaſineſs in opening the eyelids, particularly in candle light. The blood-veſſels of the internal palpebral membrane are alſo turgid, and preternaturally numerous. This diſeaſe affects often many branches of the ſame family.

Treatment.—The unguentum citrinum is a ſpecific remedy in this diſeaſe. When there is much inflammation of the eyelids, they ought to be ſcarified, and the ointment applied immediately after. A collyrium compoſed of a weak ſolution of corroſive ſublimate is alſo ſometimes uſeful.

235 *Of the Ophthalmia Tarſi.*

In many people who uſe their eyes much, particularly in candle light, and in thoſe who live freely, the internal membrane of the eyelid often becomes gorged with blood; a thick puriform fluid glues the ciliæ together in the morning, and the patient complains of an inability to move the eyelids, or to look at an object in a bright or dazzling light, without much uneaſineſs being excited. In other inſtances the eyelids become affected with ſcrofulous inflammation, the glands of Meibomius ſwell and ſuppurate, the ciliæ drop out, and the eyelids loſe their natural form.

Treatment.—Scarifying the inflamed veſſels, and applying immediately afterwards a quantity of the red precipitate ointment, ſeldom fails in bringing relief, and in many inſtances alone the ointment will anſwer. In ſome caſes the diſeaſe in the eyelid is much aggravated, and connected with affections of the ſtomach and bowels, and in ſuch the greateſt attention becomes requiſite to keep the belly regular, and even to purge.

236 *Of the Entropion.*

When the eyelids are inverted, ſo that the tarſus with its ciliæ come in contact with the eyeball, the diſeaſe is called *entropion.* This diſeaſe, Mr Crampton has ſhown, ariſes in ſome caſes from a thickened and diſeaſed ſtate of the internal palpebral membrane. In others the ciliæ are turned in upon the eye from repeated and tedious inflammation altering the form of the tarſus, and in ſome old people where the integumeuts are very looſe, the whole tarſus is inverted by the action of the orbiculari muſcle.

Treatment.—In the firſt caſe, Mr Crampton has ingeniouſly recommended that the tarſi be divided at their junction towards the external canthus, and that the eyelids thus liberated be kept in their proper ſituation by plaſters, compreſſes, and when in the upper eyelid by fixing the ſpeculum of Pellier, until ſuch time as the wound has healed. In the ſecond caſe little can be done but pulling out from their roots any of the ciliæ which may have taken a wrong direction, and repeating the operation whenever they grow again. In the third caſe the diſeaſe may be cured by removing an oval portion of the ſkin the whole length, and cloſe to the tarſus, and uniting the wound by one or two ſtitches and adheſive plaſters. This operation may be alſo adviſeable along with that of Mr Crampton, when one is not ſufficient to cure the complaint.

CHAP. XI.

Of the Diſeaſes of the EAR. 237

THE functions and ſtructure of the internal membrane of the external meatus, and alſo of the euſtachian tube and cavity of the tympanum, prove that it belongs to the mucous ſyſtem, and that it is not a continuation of the perioſteum as many anatomiſts have ſuppoſed. The analogy in the diſeaſes of this organ prove the ſame. In catarrhal affections of the pituitary membrane of the pharynx, the ear is always more or leſs affected, and often the function of the organ is much impaired. Polypi alſo grow from the cavity and membrane of the tympanum of a ſimilar ſtructure to thoſe found in other mucous ſurfaces. See *Polypi.* It is alſo ſubject to hæmorrhagies, and when it becomes inflamed, inſtead of ſuppuration taking place, there is a diſcharge of a puriform fluid from the ſurface, the ſame as what is obſerved in inflammation of the urethra, noſe, &c.*

The internal membrane of the ear is alſo ſubject to the ſame kind of thickening and contraction of the canal, as what takes place in the urethra and lacrymal ſac, &c. in conſequence of long continued inflammation†. This we might conclude from analogy, but the fact has been proved in one inſtance. Bichat diſſected the body of a perſon who had been expoſed during his life to a puriform diſcharge from the ear, in which he found a very remarkable thickening of the membrane of the tympanum, but no mark of eroſion could be detected.

The moſt common diſeaſe of the ear, and almoſt the only one which the ſurgeon can relieve, is a collection of wax in the meatus externus. Its preſence can always be determined by the inſpection of the ear; and it can be removed by directing the patient to drop ſome warm water into the ear for a few ſucceſſive nights, and afterwards ſyringing out the ſoftened wax, an operation which may be performed with a ſyringe, ſuch as is repreſented in Plate DXVII.), having fitted for it a pipe of conſiderable length.

* See *Inflammation of the Mucous Membranes.*

† See *Strictures of Mucous Membranes.*

CHAP. XII.

Of the Diſeaſes of the NERVOUS SYSTEM. 238

SECT. I. *General Remarks on the Pathology of the Nerves.*

A GREAT number of diſeaſes have been conſidered under the claſs of *nervous;* and much obſcurity has been thrown on this department of medical ſcience, from

Of the Diſeaſes of the Nervous Syſtem.

from our imperfect knowledge of the laws which regulate this part of the natural ſyſtem, and from mere ſymptoms having often been conſidered as primary affections.

Pathological inveſtigations have been alſo unſucceſsful; and in only a few caſes has the knife of the moſt ſkilful anatomiſt been able to detect any morbid alteration of ſtructure in nerves, which, during life, had been the ſeat of agonizing diſeaſe. In a few caſes, where tumors have been found growing in their ſubſtance, it is not unlikely, that the cellular ſtructure, connecting their fibrillæ, has been the firſt part affected. Their arteries and veins are ſubject to the diſeaſes of theſe ſyſtems in other organs; and we have ſeen an aneuriſmal tumor as big as a hazel nut formed in the nutrient artery of the popliteal nerve; and Bichât mentions having ſeen the veins of the ſciatic nerve varicoſe in a paralytic limb. Mr E. Home has deſcribed in the Philoſophical Tranſactions a particular tumor of one of the axillary nerves, in which it is difficult to aſcertain if the medullary portion be affected; and in the *Encyclopedie Methodique* there is a deſcription of a caſe of a diſeaſe, reſembling in ſome reſpects the caſe of Mr Home's. The diſeaſe was in the middle of the radial nerve; and as the hand had neither loſt its ſenſibility nor the movement of any of the fingers, this circumſtance led to the ſuppoſition, that the *medullary* portion of the nerve was not affected, but merely its *neurilema*. In the *fungus hæmatodes*, it is by no means improbable that there is a morbid alteration in the medullary matter of the nerves; though this fact can only be determined by an accurate examination of the diſeaſe in various organs.

Moſt diſeaſes belonging to this ſyſtem have been fully treated of in the article MEDICINE. There is only one which becomes an object of ſurgical treatment.

239 SECT. II. *Of the Tic Doleureux* (Nevralgie).

Affections of this kind are diſtinguiſhed by the nature of the pain, which is ſharp, gnawing, and, particularly at its commencement, accompanied with torpor, and ſometimes with pulſations. It is attended with no heat or redneſs, or any tenſion or ſwelling of the part. It comes on in paroxyſms, more or leſs long, and at different intervals. Sometimes the attack is periodical.

The pain is always fixed in the trunk or branch of a nerve; and, during the paroxyſm, it darts from the part firſt affected through all the ramifications of the nerve.

Many nerves of the body have been found affected with this diſeaſe. The firſt pair of the loins (nevralgie ilio-ſcrotale), the poſterior crural (iſchias nervoſa poſtica), the crural, but particularly the nerves of the face are ſubject to it. When the diſeaſe affects the face, it is generally ſituated either in the frontal nerve, in the infra-orbitar nerve, or in the ſubmental nerve. Sometimes the pain affects not only all the branches of theſe nerves, but it extends to their anaſtomoſing branches, and ſpreads to one or more of the trunks.

This diſeaſe appears to be produced from a variety of cauſes, according to which its ſymptoms are varied. Sometimes it has been known to ſucceed a local irritation, ſuch as an injury on the trunk of the nerve; and in other caſes, the affection of the particular nerve is ſympathethic of a diſeaſe in ſome diſtant organ.

Of Herniæ.

In ſome inſtances we have obſerved this diſeaſe ariſe from an affection of the primæ viæ; ſo that in all caſes it becomes the firſt object of the ſurgeon to trace the cauſe of the diſeaſe.

Treatment.—When the ſtomach or inteſtinal canal are diſordered, along with the particular affection of the nerve, the nervous affection will often ceaſe when they are reſtored to their natural ſtate. This is to be accompliſhed in moſt caſes by emetics, and a courſe of laxative medicines, purſued according to the qualities and quantity of the evacuated matter.

In ſome caſes, particularly in the affection of the frontal nerve, we have found great relief from the repeated application of ſmall bliſters over the nervous trunk. In ſome inſtances, too, the patients have experienced great relief, and have even completely recovered, by a continued attention to a very ſpare vegetable diet, or to a milk diet. The celebrated Marmontel was a remarkable inſtance of this kind.

There are, however, caſes where theſe means fail, and where the diſeaſe appears to depend on ſome fixed cauſe of irritation in the affected nervous trunk. In ſuch caſes, it is the uſual practice to divide the trunk of the nerve. This operation generally gives inſtant relief; but its effects have, we believe, in moſt caſes, been but of ſhort duration. It is a fact completely eſtabliſhed, that the ramifications of the nervous as well as of the vaſcular ſyſtem, though divided, are gradually regenerated. The numerous anaſtomoſes preſerve the life of the part on which the divided trunk was diſtributed, and the divided edges of the trunk gradually coaleſce; ſo that the nerve is again able to perform its natural functions. This reunion of the nerves does not take place ſo rapidly as we obſerve it in the arteries, in the ſkin, cellular membrane, or muſcle; and months elapſe before it is completed: but, from this reunion, it is probable, that the morbid action in tic doleureux, of the nature of which we are ignorant, the operation, in moſt caſes at leaſt, brings merely temporary relief.

When the operation is to be performed, the neceſſary ſteps are extremely ſimple. Some have contented themſelves with introducing a ſharp-pointed biſtoury through the integuments towards one ſide of the exit of the nerve, paſſing the point underneath it, and then dividing it; thus leaving only a ſmall puncture of the ſkin.

When, however, the operation is done in this manner, the divided extremities, from being ſeparated only a little way, are apt immediately to reunite; a circumſtance which ſhould be prevented. We would therefore adviſe that a free inciſion be made immediately above the nerve; that the nerve be completely divided, and either a portion cut altogether away, or the divided extremities ſeparated to a diſtance, and the wound allowed to heal by ſuppuration.

CHAP. XIII.

Of HERNIAE.

240 THE word hernia has been uſed to ſignify a protruſion of any viſcus, from its proper cavity; but we ſhall only treat in this place of abdominal hernia. The viſcera of this cavity are moſt frequently protruded at the inguinal and

and crural rings and the umbilicus. They, however, protrude alſo at the *foramen ovale*, at the *perinæum*, through the *iſchiatic notch*, and *diaphragm*.

The names that have been given to different kinds of hernia, have been derived both from the contents of the hernia, and from its ſituation. If they contain omentum only, they are called *omental hernia*, or *epiploocele*; if only inteſtine, *inteſtinal* hernia; if both, omentum and inteſtine, *entero-epiplocele*; if the ſtomach is contained in the tumor, *gaſtrocele*; if the liver, *hepatocele*; if the bladder, *cystocele*; if the uterus, *hysterocele*.

The peritonæum generally protrudes prior to any of the viſcera, forming a bag called the *hernial ſac*, in which the protruded viſcera are afterwards contained. The protruded portion of peritonæum is not dragged from its natural ſituation, but becomes elongated by gradual diſtenſion; and it is uſually not only lengthened, but more or leſs thickened.

241 SECT. I. *Of the Inguinal Hernia.*

In an inguinal hernia, the protruded viſcus enters the *abdominal* ring, paſſes along the inguinal canal, and comes out either at the inguinal ring, and goes into the ſcrotum (ſcrotal hernia), or burſts through the tendon of the external oblique muſcle (inguino-abdominal). Or, it paſſes through the tendon of the tranſverſalis, and internal oblique, and appears at the inguinal ring (abdomino-inguinal).

Inguinal hernia is more frequent in men than women, the round ligament of the uterus being of a ſmaller ſize than the ſpermatic cord. It ſometimes appears on both ſides, but moſt frequently on the right ſide.

242 Appearances on diſſection.

When the ſkin of the ſcrotum of an inguinal hernia is removed by diſſection, a faſcia is found lying underneath it, which varies in thickneſs, according to the bulk and duration of the tumor. This faſcia comes off from the tendon of the external oblique muſcle above the abdominal ring. Below this faſcia is the cremaſter muſcle, which is united both to the faſcia and hernial ſac, though eaſily ſeparable from them by diſſection. When the faſcia and cremaſter muſcle are removed, the hernial ſac is expoſed. The epigaſtric artery is ſituated on the *pubic* ſide of the ſac. The ſpermatic cord lies generally behind the ſac; ſometimes to one ſide, and ſometimes on its anterior part. Often the veſſels of the cord are ſplit, the epididimis paſſing along one ſide of the ſac, and the artery, veins, and abſorbents, on the other. Sometimes there are more than one hernial ſac on the ſame ſide. Mr Cooper found, in one caſe, two within the inguinal canal. This ariſes in ſome caſes from wearing a truſs.

In the *inguino-abdominal herniæ*, the ſac enters the abdominal ring; and, inſtead of being continued along the inguinal canal, it paſſes through the tendon of the external oblique muſcle. The hernial ſac, in this caſe, is compoſed of two diſtinct layers; the one internal and peritoneal, the other external, and produced by an elongation and gradual thickening of the aponeuroſis of the external oblique muſcle *.

* *Merry & Petit.*

In the *abdomino-inguinal* hernia, the ſac paſſes through the tendon of the tranſverſalis or the tendons of both the tranſverſalis and oblique muſcle, enters the inguinal canal, appears at the inguinal ring, and then paſſes down into the ſcrotum. In this caſe, Mr Cooper obſerves, that the ſpermatic cord lies on the upper or outer part of the ſac. The epigaſtric artery lies on the outſide of the ſac †.

† *Richter, Deſſault, Rougemont.*

The inguinal hernia is generally pyriform, ſmall towards the ring, and enlarging as it deſcends. It may be diſtinguiſhed from other ſwellings of theſe parts, by the following ſymptoms: 1. When the patient is deſired to cough, the tumor becomes immediately diſtended, owing to the preſſure of the abdominal muſcles forcing into the ſac more of the viſcera or of their contents. 2. When the patient can remember that the tumor uſed to diſappear when in the horizontal poſition. 3. When the progreſs of the tumor has been from the groin to the ſcrotum. 4. When the tumor contains inteſtine, it is elaſtic and uniform; and, when puſhed up into the abdomen, it returns with a gurgling noiſe. When omentum is contained, the tumor is leſs equal on its ſurface, receives an impreſſion with the fingers, and does not return with a gurgling noiſe. Moſt commonly, however, both inteſtine and omentum are contained in the ſac. 5. The functions of the viſcera are ſomewhat interrupted, producing eructations, ſickneſs, conſtipation, colicky pains, and diſtenſion of the abdomen.

The inguinal herniæ ought to be carefully diſtinguiſhed from hydrocele of the vaginal coat, from incyſted hydrocele of the ſpermatic cord, from enlargements of the teſticle, from hæmatocele, and from varicocele. Hydrocele and hernia, too, are often combined, particularly omental herniæ.

SECT. II. *Of Reducible Inguinal Herniæ, and of Truſſes.* 243

Herniæ are either reducible, irreducible, or ſtrangulated. In the reducible ſtate, the parts may be returned into the cavity of the abdomen. To prevent the eſcape of the bowels, and the danger of ſuch an accident, a conſtant preſſure ſhould be applied at the part where the hernia opens into the abdomen, to ſhut the mouth of the ſac, and thus oppoſe an effectual reſiſtance to the protruſion of its contents. To accompliſh theſe purpoſes, various *truſſes* have been contrived. The truſs ſhould be made of ſteel, and the ſpring not ſtronger than what is ſufficient to keep up the bowels; for, if the preſſure be great, the abdominal muſcles, where it is applied, are weakened, and even abſorbed. Mr Cooper adviſes the pad to be made of a conical form, the apex of which ſhould reſt on the mouth of the ſac. But, as there will be found much variety in the ſituation and ſize of the opening through which the hernia paſſes, it will often be neceſſary to vary the form and bulk of the pad. The truſs ought to be applied ſo that it makes preſſure not on the inguinal ring where the hernia comes out, but upon that part where the ſpermatic cord, and with it the hernia, firſt quit the abdomen; and this point may always be determined, by making the patient cough after the hernia has been reduced, and aſcertaining the furtheſt part from the inguinal ring, where the hernial ſac is found to protrude. On this point the pad ſhould reſt. If the pad be too large, and preſs merely on the inguinal ring, it will allow the bowels to paſs through the internal or abdominal ring, and enter into the inguinal canal. On the other hand, the pad ſhould

Of Inguinal Herniæ.

not be too ſmall, ſo as to preſs into the mouth of the ſac and plug it up, for that would prevent all chance of a permanent cure; the bowels may be prevented from entering into the ſac; but the pad will act as a dilater or bougie, keep the mouth of the ſac conſtantly open, and even increaſe its diameter. The pad, therefore, ought always to be made of ſuch a ſize and ſhape, as to make a preſſure on the abdominal ring, inguinal canal, and inguinal ring.

244 SECT. III. *Of Irreducible Herniæ.*

Herniæ become irreducible when the protruded parts are ſuffered to remain long in the hernial ſac and increaſe much in bulk, when membranous bands form acroſs the ſac and entangle its contents, or when an adheſion takes place between the ſac and its contents, or amongſt the contents themſelves.

Treatment.—In ſuch caſes, a bag truſs ought to be worn, ſo as to keep up a uniform and ſteady preſſure on the ſcrotum. The application of ice, too, has been known to procure the return of a hernia which appeared irreducible.

SECT. IV. *Of Strangulated Herniæ.*

A hernia is ſaid to be ſtrangulated when not only the inteſtine and omentum are irreducible, but when the protruded bowels are inflamed, and when the paſſage of the fæces through the ſtrangulated portion is completely interrupted.

245 Symptoms. The tumor is attended with conſiderable pain, which ſometimes extends through the abdomen, and is often ſituated at the umbilicus. Hiccup and vomiting ſucceed; at firſt the contents of the ſtomach only are evacuated, but afterwards thoſe of the lower portions of the alimentary canal. The bowels are completely obſtructed, except that portion below the ſeat of ſtrangulation. The pulſe is commonly quick and hard; ſometimes, however, it is full. If the diſeaſe continues, the ſkin covering the tumor becomes diſcoloured and ſlightly œdematous, and the abdomen tender and tenſe; the pulſe becomes ſmall and thready, the countenance has an expreſſion of anxiety; and all theſe ſymptoms are ſubject to exacerbations. They are greatly mitigated for a while, but ſoon recur with increaſed violence.

After having ſuffered great pain during the firſt ſtage of the diſeaſe, the patient becomes ſuddenly eaſy, and the tumor becomes of a purple colour, and has a crackling feel. The abdomen becomes more tenſe, a cold ſweat covers the body, and the pulſe is weak and intermittent. At laſt the patient, deluded with the hopes of a recovery, ſinks under the complaint.

246 Appearances on diſſection. On diſſection, the hernial ſac is generally found to contain a quantity of dark bloody ſerum. The inteſtine is of a dark chocolate brown, with black ſpots interſperſed over it, which are eaſily torn on being touched with the finger. The ſurface is covered with a layer of coagulated lymph. Even when the inteſtine is not mortified the colour is extremely dark, but then the black ſpots do not appear. Within the abdomen the whole inteſtinal canal ſometimes appears quite natural; at other times portions of the inteſtines appear inflamed, and in ſome rare caſes they are glued together by an effuſion of lymph.

On examining the ſeat of ſtricture, it will be found to take place either at the abdominal or inguinal ring. In large herniæ, Mr Cooper has remarked that the ſtricture is moſt frequent at the external opening, and then it may be often ſeen from the particular ſhape of the tumor, a conſtriction being diſtinguiſhable at that part. In other caſes the ſtricture is ſeen at the entrance of the ſpermatic veſſels into the inguinal canal; ſo that, in operating for hernia, it is not ſufficient to dilate the external ring, but it becomes neceſſary to dilate the upper part of the canal.

Treatment.—In the treatment of ſtrangulated hernia, the leading object which is to be kept in view, is to return the diſplaced viſcera as ſpeedily as poſſible, and, at the ſame time, while doing this, to diminiſh the ſymptoms of inflammation or prevent their acceſſion. 247 Taxis. The firſt thing to be attempted, except when the tumor is much inflamed and painful, is the *reduction* of the hernia. In doing this, it is neceſſary to attend to the poſition of the patient and the mode of applying the preſſure. The body of the patient ſhould be placed on an inclined plane, with the head downwards, and the thighs bent towards the trunk of the body. The preſſure which is employed on the tumor ſhould always be directed upwards and outwards along the courſe of the ſpermatic cord, and it may be perſevered in from a quarter to half an hour. Beſides theſe mechanical means, tobacco clyſters, and cold, have been uſeful in accompliſhing the reduction. Ice is the eaſieſt and beſt mode of applying cold to hernial tumors; but, when this cannot be procured, Mr Cooper uſes a mixture of equal parts of ſal ammoniac and nitre. To one pint of water in a bladder, ten ounces of the mixed ſalts are added, the bladder tied up, and then laid over the tumor. If, after four hours, the ſymptoms become mitigated, and the tumor leſſens, this remedy may be perſevered in for ſome time longer; but if they continue with equal violence, and the tumor reſiſt every attempt to reduction, no further trial ſhould be made of the application.

248 Operations. The operation which it is now neceſſary to perform, conſiſts in making an inciſion through the integuments along the upper part of the tumor, making an opening into the hernial ſac, and extending it, ſo as to allow the contents to be examined, and the fore finger to reach the ſeat of ſtricture. The ſtricture will be readily detected by the point of the finger, and may be eaſily divided by introducing the biſtoury along the finger, till the point of it paſſes below the ſtricture.* A very ſlight preſſure of the edge of the inſtrument will be ſufficient to divide the ſtricture, and allow the bowels to be returned into the abdomen. If merely the ſtricture is divided, and it is never neceſſary to extend the inciſion further, it is of little importance in which direction the inciſion is made; though ſurgeons have been at great pains to point out the dangers which might ariſe were it of too great an extent.

* See Plate DXIX.

SECT. V. *Of Femoral Herniæ.* 249

In femoral hernia, the hernial ſac lies beneath the crural arch, being puſhed through an opening between the edge of the broad inſertion of Poupart's ligament and the pubic ſide of the femoral vein.† As the tumor enlarges, inſtead of falling downwards like the inguinal hernia,

† See Plate DXX.

Of Femoral Herniæ.

hernia, it passes forwards, and often turns over the anterior edge of the crural arch. As it proceeds, the swelling increases more laterally than upwards or downwards; so that it assumes an oblong shape. In the crural hernia, the sac has two coverings besides the integuments; the superficial fascia of the external oblique muscle, and the *fascia propria* of Mr Cooper, which is formed by the protrusion of the fascia which naturally covers the opening through which the hernia passes, and the fascia of the crural sheath. The taxis and use of trusses are the same in femoral as in inguinal hernia; and the same series of symptoms indicate the necessity of an operation in both when strangulated.

Operation.—Mr Cooper recommends that the incision of the integuments be made in the form of a T, beginning one incision about an inch and a half above the crural arch, in a line with the middle of the tumor, and extending it downwards below the arch, and meeting a second incision nearly at right angles with the other, the whole length of the tumor. The two fascias are next to be divided, and the hernial sac opened at its lower part, sufficiently large to admit readily the finger. The seat of the stricture is to be ascertained by the introduction of the point of the fore finger under the crural arch, and it may be readily divided in a direction upwards and inwards, of a sufficient extent to liberate the intestine; generally a very slight motion of the edge of the bistoury will be found sufficient for that purpose.

250

Chap. XIV.

Of Hare-lip.

The hare-lip is a fissure in the upper lip, very seldom in the under one.* It is attended with want of substance, and has its name from a resemblance to the lip of a hare. In general it is only a simple fissure, though sometimes it is double.

* See Plate DXXIV.

In proceeding to the operation, the patient, if a child, should be secured upon a table; but if an adult, he is to be seated upon a chair, in a proper light. The frænum connecting the gums to the upper lip is to be divided; if a fore-tooth project so much as to prevent the parts from being brought properly together, it is to be extracted; or when the fissure runs through the bones of the palate, if a small portion of the bone project, this must be removed. The operator is then to lay hold of one side of the fissure between the thumb and fore-finger, or between the forceps †, then with a pair of sharp and very strong scissars, or with a scalpel, to cut off a thin portion of the lip, and to repeat the same thing upon the other side of the fissure, so as to render the whole edges of the fissure completely raw; by which, if the operation be properly performed, a piece will be separated in form like an inverted V. After the incisions have been made, the vessels should be allowed to bleed freely to prevent inflammation; and when the bleeding has ceased, the sides of the wound are to be brought accurately together, and kept in that state by the twisted suture. The first pin ought to be as near as possible to the red edge of the lip; another is to be inserted near the upper angle; and if the patient be an adult, a third pin will generally be necessary, half way between the other two. In passing them, they ought to go rather deeper than half through the lip, that the edges of the wound may be kept properly in contact. An assistant now keeps the parts together, while the operator applies a firm waxed ligature first to the under pin; and having made three or four turns with it in the form of an eight figure, it should then be carried about the second, and in a similar way about the third, care being taken that the thread be drawn of a proper tightness. When, from a great want of substance, the retraction has been considerable, some advantage is derived from the use of adhesive plasters applied to the cheeks and tied between the pins. During the time of the cure the patient should be fed upon spoon-meat, and prevented from making any exertion with the lips, otherwise the cure might be considerably retarded. At the end of five or six days the pins may be taken out, when the parts will commonly be found completely united.

† Plate DXXIV.

In the case of a double hare-lip, the operation should be first done upon one fissure; and when a cure is completed there, it may be done safely upon the other.

Chap. XV.

Of Amputation.

251

There are two modes generally employed for performing amputation; the common operation by two circular incisions, and the *flap* operation. We shall describe in detail both these modes of operating in the thigh.

Amputation.

252 Amputation of the thigh.

The patient should be placed on a table of a convenient height, in such a manner that the diseased limb may hang over the edge of it, and be secured by an assistant seated on a low chair before him; the other limb and the arms are also to be secured by proper assistants. The tourniquet (see Plate DXVI.) is to be placed on the thigh, three or four inches below Poupart's ligament, where the femoral artery may be most easily and completely compressed. Dessault preferred to the tourniquet, the finger of a strong and intelligent assistant. A cushion fixed on a handle answers very well for making pressure on the artery when a tourniquet is not to be used; and it is a useful instrument to have in readiness, in case the tourniquet should go wrong; or when it becomes necessary to amputate the thigh so far up, that a tourniquet cannot be safely fixed.

After the operator has determined on the place for the incision of the integuments, an assistant should grasp the limb with both hands a little above the place where the skin is to be divided, and draw it upwards as far as possible. The operator then with the knife (see Plate DXXII. fig. 10.) makes a circular incision through the skin and cellular membrane, down to the muscles; and this may be done, either by one stroke of the knife, or by first making one semicircular incision round the under part of the limb, and afterwards another incision upon the upper part corresponding with the former. When this is made, the integuments retract considerably from their natural elasticity, and they are to be separated from the muscles and dissected with the point of the knife, as far back as to leave a sufficient quantity of skin to cover the stump. The skin being turned back, the operator,

Amputation.

operator, by a ſecond inciſion carried cloſe to its inverted edge, cuts the muſcles perpendicularly down to the bone. During this part of the operation, care ſhould be taken to avoid wounding the edge of the ſkin, by tracing attentively the edge of the knife during the whole courſe of the inciſion. After the muſcles are divided, a conſiderable retraction takes place, and any muſcular fibres attached to the perioſteum ſhould be ſeparated from it by the point of the knife, in order to allow the bone to be ſawn through as high as poſſible, and thus ſecure to it a firm fleſhy covering. All the ſoft parts are next to be drawn upwards as far as their ſeparation from the bone will admit of. They are to be kept in this ſituation by an inſtrument called the *retractors*, until the bone is ſawn through. The retractors may be either made of iron plates (ſee Plate DXXII. fig. 5.), or a piece of linen or leather cut as repreſented in fig. 6. The aſſiſtant who uſes either of theſe inſtruments, ſhould take care when he applies them, that the ſoft parts are completely out of the reach of the ſaw, and that they are held back as far as the place where the bone is to be divided. Any ſharp edges which may be left on the end of the bone after it has been ſawn through, ſhould be taken away with pliers, Plate DXXII. fig. 8. The arteries are next to be tied, and both the femoral artery and vein may be included in one ligature. The bleeding being ſtopped, and the wound cleaned, the tourniquet is to be altogether taken away, and the ſoft parts drawn down, ſo as to cover the extremity of the bone. In order to keep them in this ſituation, a bandage of thin flannel or cotton cloth, not exceeding two inches and a half in breadth for an adult, is to make one or two circular turns round the body above the ilium; it is then to be carried obliquely over the groin, and turned round the upper part of the thigh pretty firmly two or three times, forming as it were at this place a point of ſupport to the muſcles and ſkin. It is afterwards to be paſſed in a ſpiral manner downwards to near the edge of the wound, taking care to pull the ſoft parts towards the ſtump, whilſt applying each turn of the bandage. The turns ſhould not be ſo tight as to cauſe pain, but ſufficient to keep the parts in the ſituation in which they are placed. The ſurface of the muſcles and the edges of the ſkin are now to be accurately brought together in ſuch a direction, that the wound forms a ſtraight line, extending from the anterior to the poſterior aſpect of the limb. Strips of adheſive plaſter, about half an inch in breadth, and eight or ten inches in length, ſhould be applied, in order to keep the lips of the wound in this poſition. Thoſe over the middle part of the wound ought to be put on firſt; and great attention is neceſſary in their application, to prevent the edges of the ſkin from overlapping and puckering. They ſhould be of ſuch a number as completely to cover the ſurface of the wound, leaving only a ſmall opening for the ligatures of the arteries to be brought out at that part of the wound neareſt the place where the artery is ſituated. The wound is to be afterwards covered with a piece of linen or caddis ſpread with ſimple ointment, and a compreſs of fine tow laid over it, the whole being ſecured by a few turns of the roller.

The bedclothes ſhould be kept from preſſing upon, and coming in contact with the ſtump, by a frame or cradle, as it is called. (See Plate DXXIII. fig. 11.).

Lithotomy.

253 Flap operation.

When this operation is to be performed, the inciſion of the integuments may be made, either with a common ſcalpel, or with the end of the amputating knife, as repreſented in Plate DXXII. fig. 10. After the ſkin is divided, it is of importance to allow it to retract as much as poſſible, by cutting the fibres of cellular membrane which connect it with the faſcia of the thigh, before dividing the muſcles. If the limb be much emaciated, the diviſion of the muſcles may be alſo made with the ſcalpel; if, on the contrary, the limb be bulky, the inciſion ought to be made by a common amputating knife, in order that the ſurface of the flaps be plain and uniform. After dividing the muſcles obliquely upwards down to the bone, they ſhould be ſeparated from it a ſufficient way, ſo as to leave enough to cover the end of the bone, and they ſhould be allowed to contract as much as poſſible before the bone is ſawn through. After the limb is amputated, and the circular bandage applied, the flaps will be found to meet very accurately together, and to form a round and ſmooth ſtump. From the angles of the ſkin being removed, no puckering or corners are left, and the two ſurfaces and muſcles being applied to each other, and covering the end of the bone, give it a firm and fleſhy covering, whereas in amputations performed in the common mode, the bone is covered by integuments alone. The adheſive plaſters are to be applied in the ſame manner, and the patient is to be treated afterwards as in the other modes of operating.

The general rules to be attended to in amputation in other parts of the body, are the ſame as thoſe already mentioned; and in Plate DXXII. and DXXIII. we have delineated the place and direction of the inciſions.

Chap. XVI.

Of Lithotomy.

254

The manner of preparing the patient for this operation depends upon a variety of circumſtances. If he be plethoric, a few ounces of blood ſhould be taken away, and at proper intervals the bowels ought to be emptied by any gentle laxative which will not gripe. The diet ſhould conſiſt of light food for ſome time previous to the operation. If the pain be violent, opium is neceſſary. Sometimes it is relieved by keeping the patient in bed with the pelvis raiſed, ſo as to remove the ſtone from the neck of the bladder. He ought not to ſit up, or take any exerciſe, in the time of preparation. The warm bath ought to be uſed two or three times, and the patient ſhould remain in it half an hour at each time. A laxative ought to be given on the day preceding the operation, and an injection a few hours before it is performed. The patient ought to drink plentifully of ſome diluent liquor, and to retain the urine ſeveral hours previous to the operation. If this cannot be readily effected, a ſlight compreſſion, by means of a ligature, may be made upon the penis, ſo as to have the bladder ſufficiently diſtended, that there may be no danger of the poſterior ſurface being hurt by the end of the gorget. The perinæum and parts about the anus ſhould be well ſhaved.

A table ſomewhat more than three feet in height, and of ſufficient ſtrength, is to be firmly placed,

Lithotomy.

and properly covered with blankets, pillows, &c. Upon this the patient is to be laid and properly secured; and for this purpose there ought to be two pieces of broad firm tape, each about five feet in length, which are to be doubled, and a noose formed upon them. A noose is to be put upon each wrist, and the patient desired to lay hold of the middle of his foot upon the outside. One end of the ligature is to go round the hand and foot, and the other round the ankle and hand, and cross again, so as to repeat the turns in the reverse way. A running knot is to be tied, by which the hand and foot will be properly secured. The buttocks are then to be made to project an inch or two over the table, and to be raised considerably higher than the shoulders by a couple or more pillows, and one pillow ought to be put under his head.

The operator is now to introduce a grooved staff (Plate DXXI. fig. 5.) of proportionable size, and open to the end, through the urethra into the bladder; and having fully satisfied himself of the existence of a stone, he inclines the staff, if he be right-handed, obliquely over the right groin, so that the convex part of the staff may be felt in the perinæum on the left side of the raphe. He then fixes it, and delivers it to his assistant, who is to hold it with his right hand, desiring him to press it gently, in order to make the sulcus of the staff project in the direction in which he received it. With his left hand the same assistant is to raise and support the scrotum.

The thighs of the patient being sufficiently separated by the assistants, and the surgeon being seated upon a chair of a proper height, and in a convenient light, he makes an incision with a common convex-edged scalpel through the skin and cellular substance, below the symphysis of the ossa pubis, which is a little below the scrotum, and where the crus penis and bulb of the urethra meet, and on the left side of the raphe, and continues it in a slanting direction downwards and outwards to the space between the anus and tuberosity of the ischium, ending somewhat lower than the basis of that process, by which a cut will be made of three or four inches in length. This incision ought not to be shorter than is here directed, otherwise there will not be room for the rest of the operation. As soon as the integuments are divided, he ought to introduce two of the fingers of the left hand. With one he keeps back the lip of the wound next the raphe, and with the other he presses down the rectum. He ought likewise particularly to guard against cutting the crura of the penis, which he can readily feel, and separate at their under part with one of his fingers. He next makes a second incision almost in the same direction with the first, but rather nearer to the raphe and anus, by which he preserves the trunk of the *arteria pudica*. By this incision he divides the transversalis penis, and as much of the levator ani and cellular substance within these as will make the prostate gland perceptible to the finger. If any considerable vessel be cut, it is immediately to be secured, though this is seldom necessary. He is now to search for the groove of the staff with the fore finger of his left hand, the point of which he presses along from the bulb of the urethra to the prostate gland, which surrounds the neck of the bladder. He keeps it there; and turning the edge of the knife upwards, he cuts upon the groove of the staff, and freely divides the membranous part of the urethra, till the staff can be felt perfectly bare, and that there is room to admit the nail of the finger; and as the finger assists in keeping the parts stretched, and effectually prevents the rectum from being hurt, the incision into the urethra may be made with perfect ease and safety.

The next part of the operation, viz. dividing the prostate gland and neck of the bladder, might, by a dexterous operator, be safely performed with a common scalpel, with the edge turned the opposite way. But to guard against accidents, a more convenient instrument, called the *cutting gorget*, is now in general use. It was originally invented by Mr Hawkins of London, and since his time has undergone various alterations.* The membranous part of the urethra being now divided, and the fore finger still retained in its place, the point of the gorget, previously fitted to the groove, is to be directed along the nail of the finger, which will serve to conduct it into the groove of the staff; and as this is one of the nicest parts of the operation, the most particular attention is required that the point of the gorget be distinctly felt to rub in the bare groove.

* See Plate DXXI. Fig. 2.

The operator now rises from his seat, takes the staff from the assistant, raises it to near a right angle, and presses the concave part against the symphysis of the ossa pubis; satisfies himself again that the point or beak is in the groove, and then pushes on the gorget, following the direction of the groove till the beak slip from the point of the staff into the bladder. The gorget is not to be pushed farther than this, otherwise it may wound the opposite side of the bladder, &c.

The gorget having now entered the bladder, which is readily known by the discharge of urine from the wound, the staff is to be withdrawn, and the finger introduced along the gorget to search for the stone, which, when felt, will point out the direction to be given to the forceps; at any rate, the introduction of the finger serves to dilate the wound in the bladder; and this being done, a pair of forceps † of a proper size, and with their blades as nearly together as their form will allow, are to be introduced, and the gorget withdrawn slowly, and in the same direction in which it entered, so as to prevent it from injuring the parts in its return. After the forceps are introduced, and passed till they meet with a gentle resistance, but no farther, the handles ought to be depressed till they are somewhat in an horizontal direction, as this will most correspond with the fundus of the bladder. One blade of the forceps is to be turned towards the symphysis of the pubes, to defend the soft parts there; the other of consequence will guard the return. After they have distinctly touched the stone, by moving them a little in various directions, they are then to be opened, and the stone laid hold of, which may generally be done with considerable ease. It frequently happens, however, that when the stone is small, it is not readily felt with the forceps; and instances may happen where the under and back part of the bladder may be so depressed as to conceal the stone. In such a situation, nothing will more readily bring it in the way of the forceps than to introduce the finger into the rectum, and elevate this part of the bladder. Straight forceps are generally used; crooked ones, in some very rare cases, however, may be necessary, and therefore the surgeon ought to be provided with them.

† Plate DXXI. Fig. 6. & 7.

After

Lithotomy. After the forceps has laid hold of the ſtone, if it be ſmall and properly placed, it may readily be extracted: but if, on the contrary, the handles of the forceps are now obſerved to be greatly expanded, it is certain the ſtone is improperly fixed, or that it is remarkably large: in either caſe it ſhould not be held faſt, but allowed to move into the moſt favourable ſituation; or the finger is to be introduced ſo as to place it properly for extraction. If this cannot be done with the finger, it ought to be allowed to ſlip out of the forceps, in order to get it more properly fixed; and as the moſt common form of the ſtone is flat and oval, or ſomewhat like a flattened egg, the forceps ſhould have hold of the ſmalleſt diameter, while an end preſents to the neck of the inſtrument. The ſtone ſhould be graſped with no greater firmneſs than is merely ſufficient to bring it fairly out, and it ſhould be extracted in a ſlow gradual manner. Lithotomy.

EXPLANATION OF THE PLATES.

Plate DXIII.

Fig. 1. and 2. Common ſcalpels. Fig. 3. A blunt-edged ſilver knife for diſſecting cloſe to important parts. Fig. 4. and 5. A ſharp and blunt-pointed biſtoury. Fig. 6. Richter's hernia knife. Fig. 7. Diſſecting forceps. Fig. 8. A blunt hook. Fig. 9. and 12. Directories. Fig. 10. and 11. Diſſecting hooks. Fig. 13. Lancet. Fig. 14. 15. and 16. Seton needles. Fig. 17. and 18. Sharp and blunt-pointed needles. Fig. 19. Outline of a ſteatomatous tumor, the dotted line pointing out the direction in which the inciſion of the integuments ought to be made for its extirpation.

Plate DXIV.

Fig. 1. 2. and 3. ſhew the different forms of the points of bougies. Fig. 4. 5. and 6. are different ſizes of ſilver balls uſed by Mr C. Bell for introducing into the urethra in order to determine the form and length of ſtrictures. Fig. 7. An outline taken from a caſt of the urethra, to ſhew the difference of the diameter at different parts of that canal. Fig. 8. and 9. ſhew the form of ſtrictures in the urethra. Fig. 10. ſhews a ſtricture in the œſophagus. Fig. 12. and 13. Male and female ſyringes. Fig. 14. Scarificator for the throat. Fig. 15. is the apparatus for injecting hydrocele.

Plate DXV.

Fig. 1. and 2. Forceps for removing polypi deſcribed in Chap. III. Sect. V. Fig. 3. 5. and 6. Inſtruments for removing polypi by ligature. Fig. 7. Outline of one large and two ſmall polypi in the rectum. Fig. 8. A breaſt-glaſs. Fig. 9. Cheſelden's needle. Fig. 10. A ſpeculum oris. Fig. 11. Mudge's inhaler.

Plate DXVI.

Fig. 1. Drawing of a femoral aneuriſm given by Mr Freer. *a* is the direction and extent of the inciſion as made by Mr Abernethy. The artery, however, may be more eaſily tied by making an inciſion parallel to Poupart's ligament (*b*). *c* is the place and direction where the inciſion ought to be made in the high operation for popliteal aneuriſm. Fig. 2. is the inſtrument uſed for compreſſing the artery or aneuriſmal tumor. Fig. 3. The common tourniquet.

Plate DXVII.

Fig. 1. 2. and 3. Different forms of extracting knives. Fig. 4. Beer's lancet for extracting the capſule of the lens. Fig. 5. Inſtruments for ſcarifying the eyelids. Fig. 6. A thin ſcalpel for paring the cornea. Fig. 7. Inſtrument for holding down the under eyelid. Fig. 8. Pelier's ſpeculum. Fig. 9. Capſule forceps of Wenzel. Fig. 10. Eye ſciſſars. Fig. 11. 12. 13. 14. and 15. have been referred in N° 224. Fig. 16. repreſents the wound of the cornea where the knife has been entered too near the inner edge of the pupil; Fig. 17. where it has been brought out at too great a diſtance from the ſclerotic coat; Fig. 18. where it has been brought out too cloſe to the ſclerotic coat. Fig. 19. A curette and Daniel's ſpoon. Fig. 20. Scarpa's needle: Fig. 21. ſhews its point magnified. Fig. 22. Common ſpear-pointed couching needle. Fig. 23. Fiſtula lachrymalis ſyringe. Fig. 24. The ſtyle for introducing into the lachrymal duct. Fig. 25. Tube for introducing into the lachrymal duct; and fig. 26. Inſtrument for introducing the tube.

Plate DXVIII.

Shews the external appearance of herniæ. Fig. 1. is a femoral hernia, the tumor being unequal and divided into two portions at *a*; the iliac portion is formed of ſwelled glands, and the pubic contains the inteſtine. Fig. 2. is a ſpecimen of inguinal hernia, and fig. 3. of inguino-abdominal.

Plate DXIX.

Fig. 1. Common inguinal hernia, copied from Mr Cooper's plate. *a*, The abdominal ring. *b*, Poupart's ligament. *c*, The femoral artery. *d*, The epigaſtric artery. *e*, Hernial ſac below the ring. *f*, Hernial ſac above the ring. *g*, Sharp part of the knife introduced between the ring and the ſac, with its ſide placed towards the ſac. Its edge ſhould be turned forwards to divide the ſtricture. Fig. 2. The hernia on the inner ſide of the epigaſtric artery. *a*, The abdominal ring. *b*, Poupart's ligament. *c*, The femoral artery. *d*, The epigaſtric artery. *e*, Internal oblique and tranſverſe muſcles paſſing over the ſac. *f*, Tendon of the tranſverſe muſcle paſſing under it. *g*, Faſcia from Poupart's ligament, from which the cord has been withdrawn to ſhew the place through which it paſſes. *h*, *i*, The hernial ſac. *k*, Knife introduced to ſhew the manner of dilating the ſtricture, which Mr Cooper directs always to be done forwards and upwards, oppoſite to the middle of the mouth of the hernial ſac, in all the varieties of inguinal hernia. Fig. 3. Form of the hernial truſs; and fig. 4. Mode in which it ſhould be applied.

Plate DXX.

Fig. 1. Crural hernial ſac removed to ſhew the hole by which it deſcended in the female. *a*, Seat of the pubes. *b*, Crural arch extending towards the ilium. *c c*, Abdominal muſcles. *d*, Crural arch. *e*, Faſcia lata.

Explanation of the Plates.

lata. *f*, Semilunar edge of the fascia lata. *g*, Third insertion of the external oblique. *h*, Crural artery. *i*, Crural vein. *k*, Crural sheath. *l*, Abdominal ring. *m*, The orifice by which the crura hernia descends formed on the outer side by the crural sheath; on the inner by the semicircular insertion of the tendon of the external oblique; and above, in part, by the crural, and in part by the semilunar edge of the fascia lata. Fig. 2. A small crural hernia in the female; shewing its passage through the crural sheath, and its distance from the crural arch. *a*, Seat of the symphysis pubis. *b*, Spinous process of the ilium. *c*, Crural arch. *d*, Abdominal ring. *e*, Fascia lata. *f*, Semilunar edge of the fascia lata. *g*, Portion of the crural sheath. *h*, Saphena major vein passing into the crural sheath. *i*, Hernial sac inclosed in its fascia, which is extremely dense, and is proportionably so as the hernia is small. *k*, The hole in the crural sheath through which the hernia passes. Fig. 3. A small crural hernia dissected. *a*, Seat of the symphysis pubis. *b*, Seat of the spinous process of the ilium. *c*, Tendon of the external oblique muscle. *d*, Internal oblique and transversalis. *e*, Fascia of the transversalis. *f*, Tendon of the transversalis. *g*, Inner portion of the fascia transversalis, passing to unite itself with the tendon. *h*, The crural arch. *i i*, Round ligament. *k*, The round ligament passing into the abdomen. *l*, Crural artery. *m*, Crural vein. *n*, Origin of the epigastric artery. *o*, Course of the epigastric artery behind the round ligament. *p*, Crural nerve. *q*, Superficial fascia. *r*, Fascia propria of Mr Cooper, the hernial sac having been drawn into the abdomen to shew this fascia distinctly. Fig. 4. shews the form and mode of applying the truss in femoral hernia.

Plate DXXI.

Fig. 1. An umbilical hernia truss. (*a*), The pad. (*b*), The spring added to the pad. (*c*), An elastic band to assist the pressure of the pad; the lower (*b*) points to the belt which is added to keep this truss in its place in corpulent people. Fig. 2. 3. 4. Different forms of the gorget, as used by Hawkins, Cline, and Cooper. Fig. 5. The staff. Fig. 6. and 7. Different forms of the forceps for the extraction of stones from the bladder.

Plate DXXII.

Fig. 1. A lateral view of the thigh and leg; the dotted lines shewing the direction of the incision in amputation. Fig. 2. An anterior view. Fig. 3. Form of the stump; and, Fig. 4. Mode of applying the circular bandage. Fig. 5. 6. and 7. Retractors. Fig. 8. Pliers for removing any spicule of bone. Fig. 9. Head of a trephine, two-thirds of the cutting teeth being removed. This instrument is intended for removing the ends of bones, particularly those of the metatarsus and metacarpus. Fig. 10. and 11. Amputating knives. Fig. 12. Amputating saw.

Plate DXXIII.

Fig. 1. Lateral view of the arm and hand, the dotted lines shewing the direction of the incision, in amputation at the shoulder joint and last joint of the forefinger. Fig. 2. and 3. Saws used in amputations of the hands and feet. Fig. 4. 5. 6. 7. 8. and 9. shew the different parts of an artificial leg. Fig. 11. Cradle used after amputation in order to prevent the bedclothes pressing upon the limb.

Plate DXXIV.

Fig. 1. shews the hare-lip with a fissure of the palate. Fig. 2. The simple hare-lip. Fig. 3. A double hare-lip with two irregular teeth. Fig. 4. shews the part of the lip into which the pins ought to be introduced. Fig. 5. shews the mode in which the ligatures ought to be applied. Fig. 6. The lip after the operation. Fig. 7. and 8. Pins for the lip. Fig. 9. Lip forceps. Fig. 10. Lip forceps, with one blade broader than the other, which is covered with wood in order to make resistance, and not injure the edge of the knife. Fig. 11. Strong scissars for dividing the lip. Fig. 12. Scissars with curved blades to be used when the lip is very thick, and not easily grasped by the common scissars. Fig. 13. Shews the appearance of the club-foot. Fig. 14. Machine invented by Scarpa for the cure of club-feet. Fig. 15. Distorted foot from a relaxed state of the ligaments, a deformity which may, in general, be removed by wearing a boot, fig. 16. to which is fixed a steel-rod, extending from the sole of the foot to the knee.

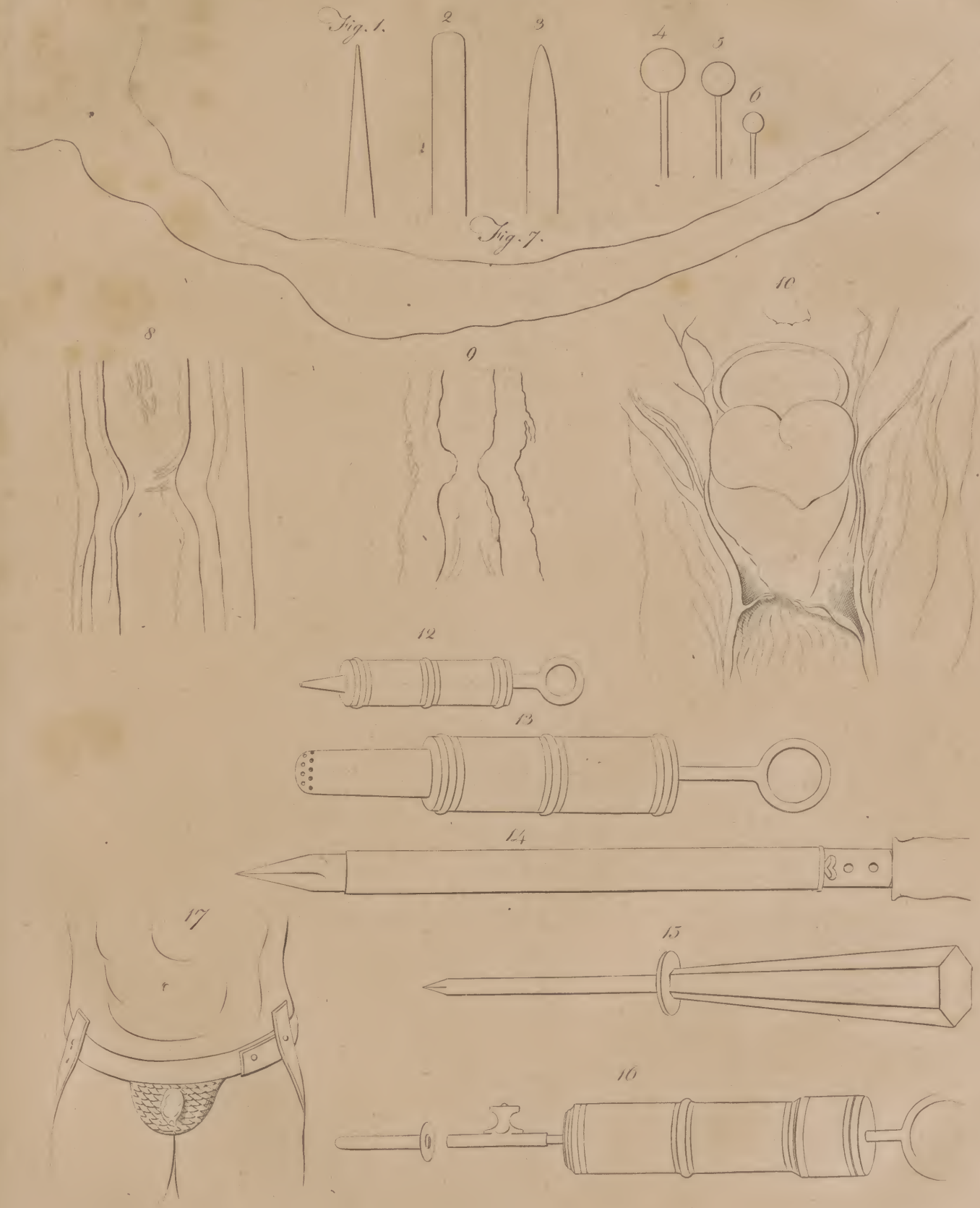
INDEX.

Maturation

SURINAM,

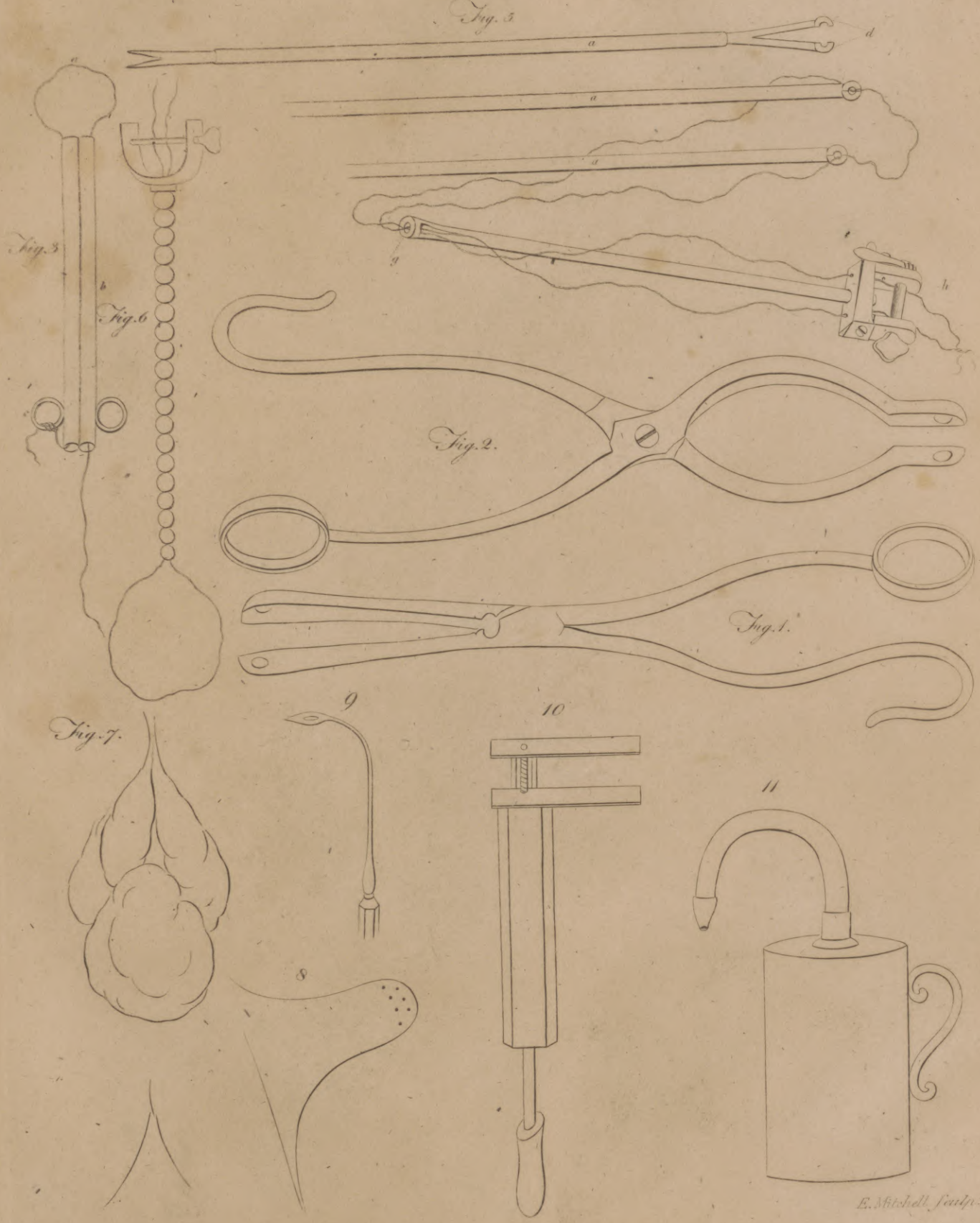
SURGERY

E. Mitchell Sculp.



E. Mitchell sculp.t

SURGERY



E. Mitchell, Sculp.

Fig. 1.

Fig. 2.

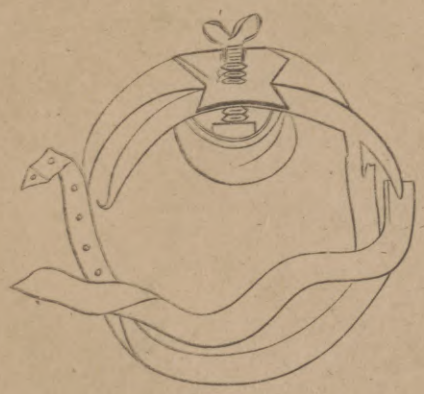
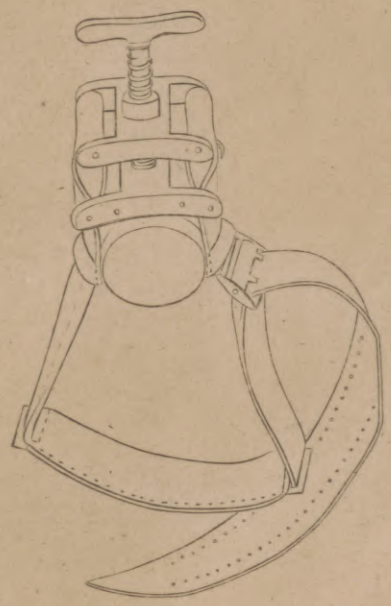
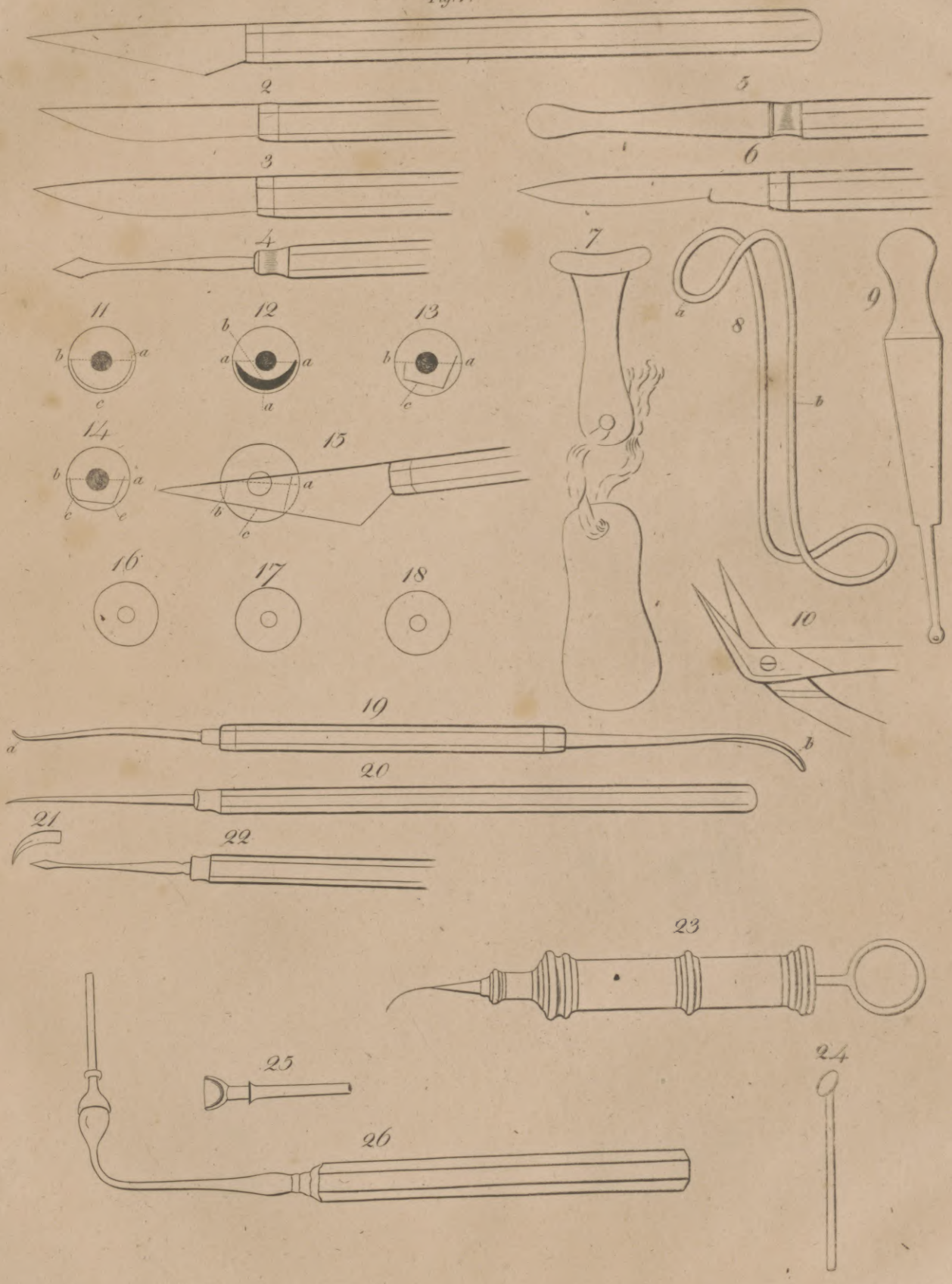


Fig. 3.



SURGERY

Fig. 1.



E. Mitchell Sculp.t

Fig. 1.
Femoral Hernia

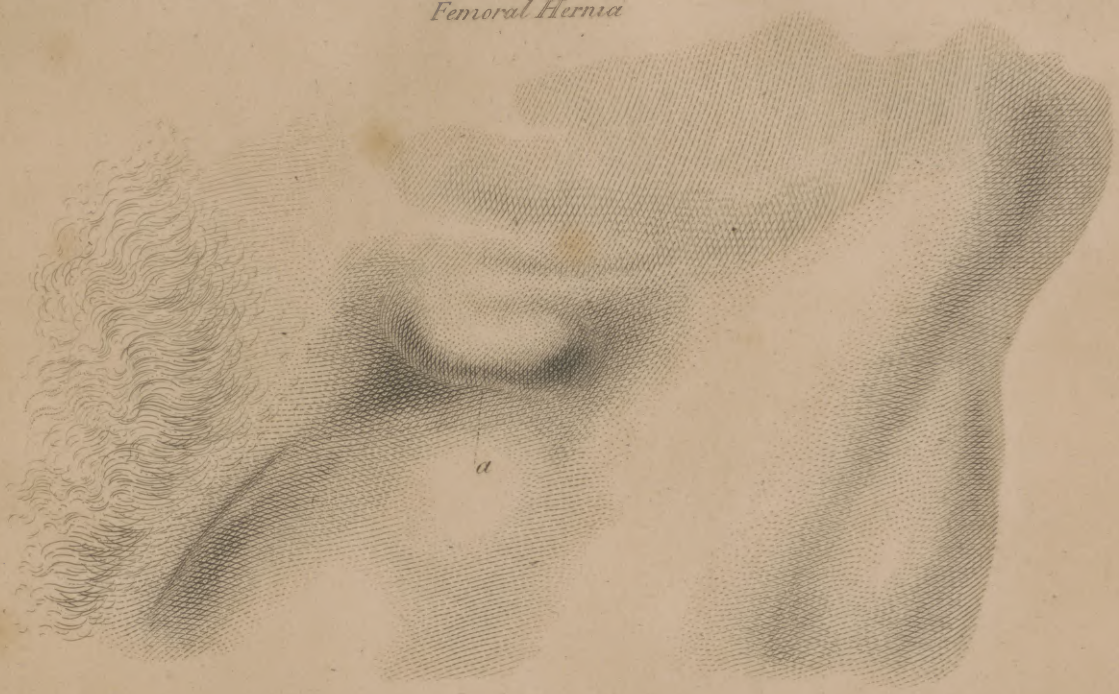
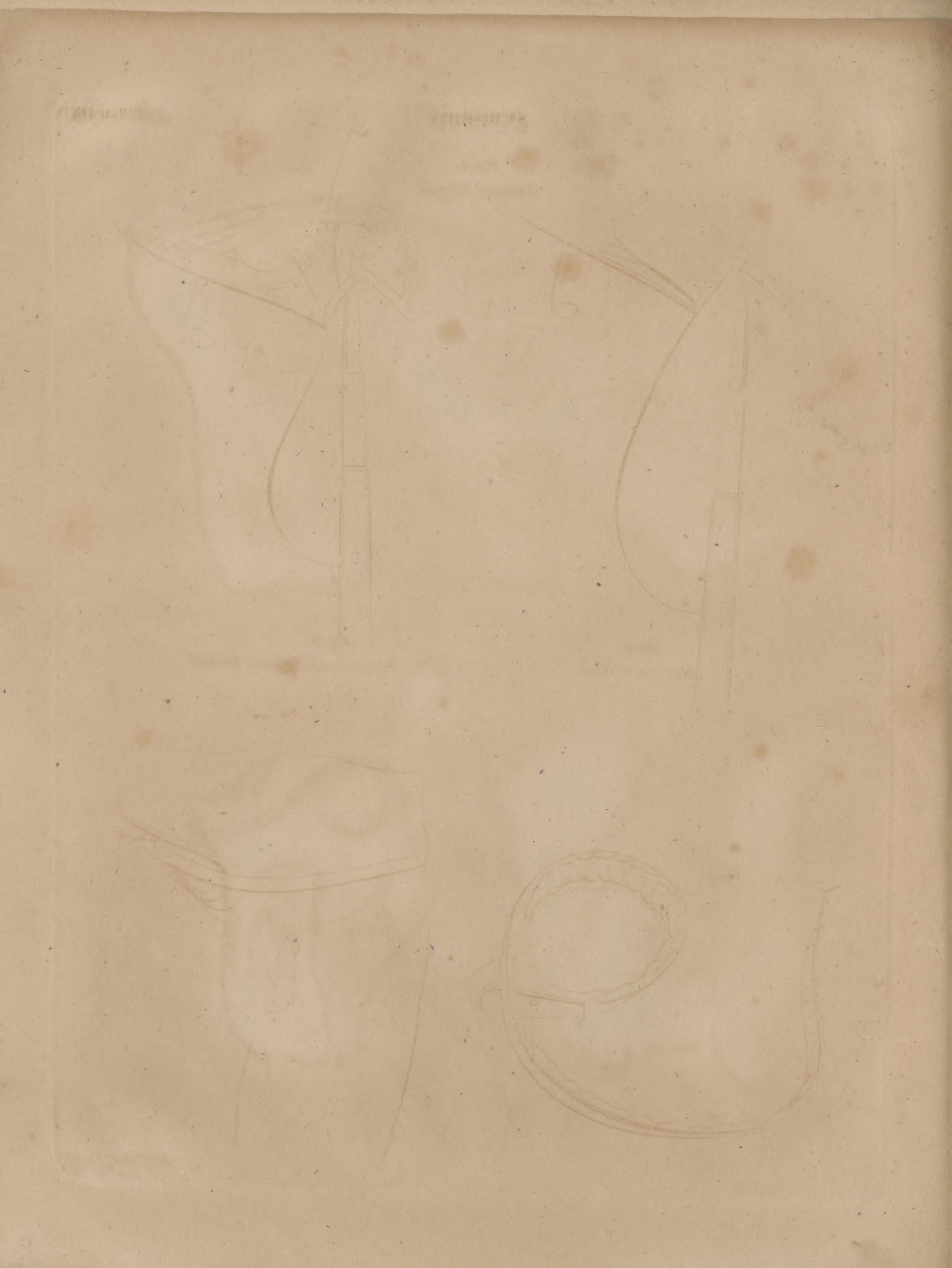
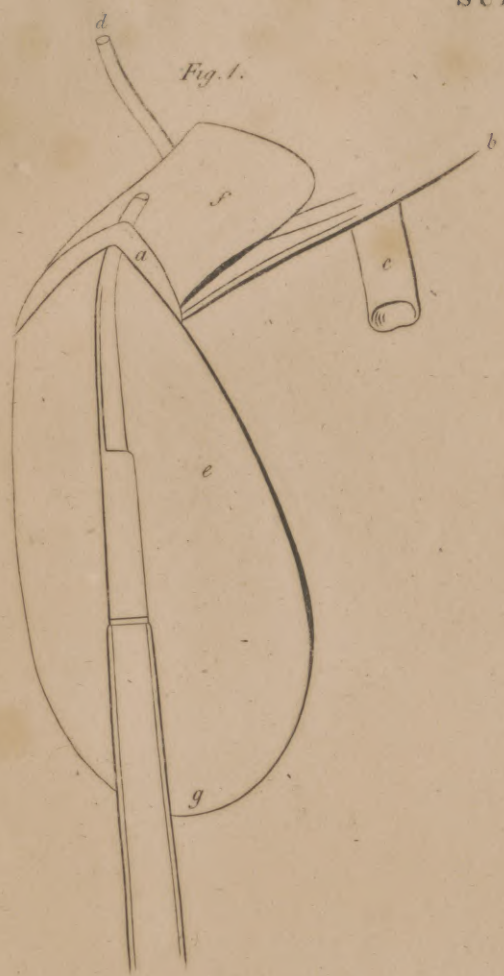


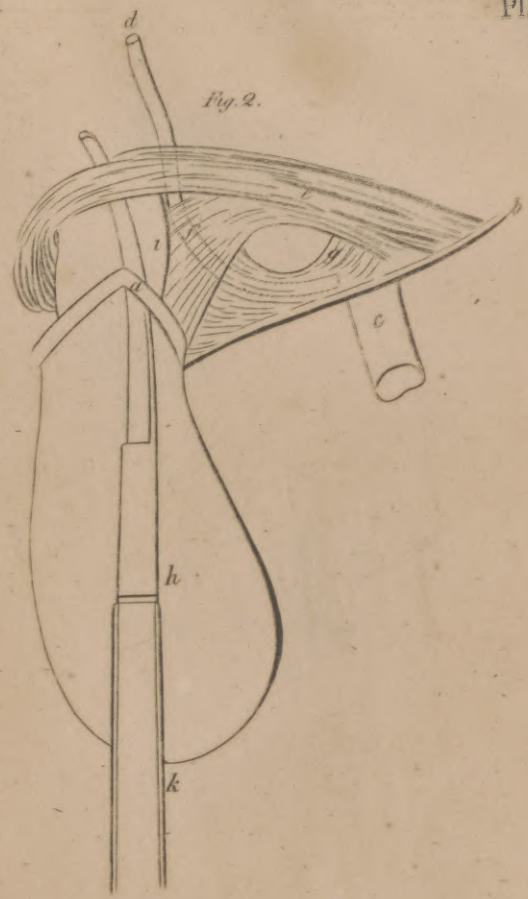
Fig. 2.
Inguinal Hernia

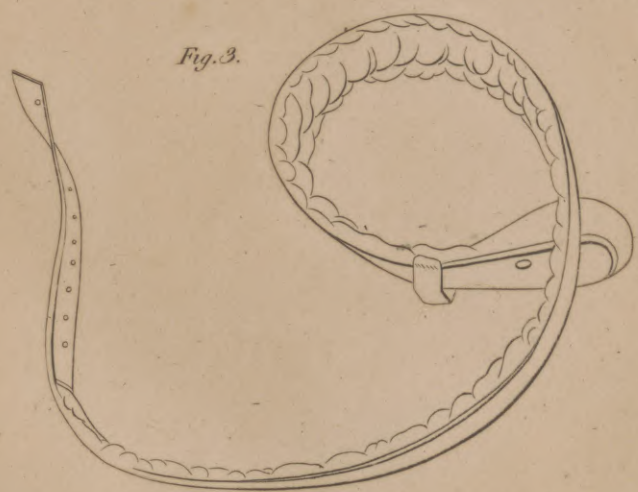
Fig. 3.
Inguinal Abdominal Hernia

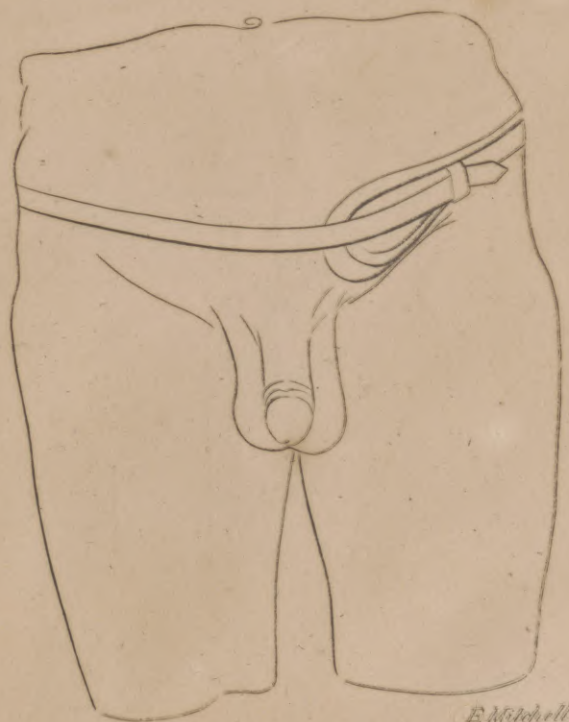
E. Mitchell sculpt.











E. Mitchell sculp.t

Fig. 1.

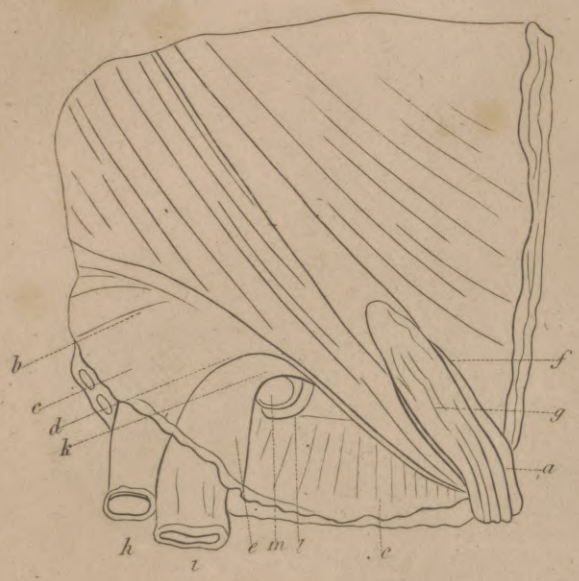


Fig. 2.

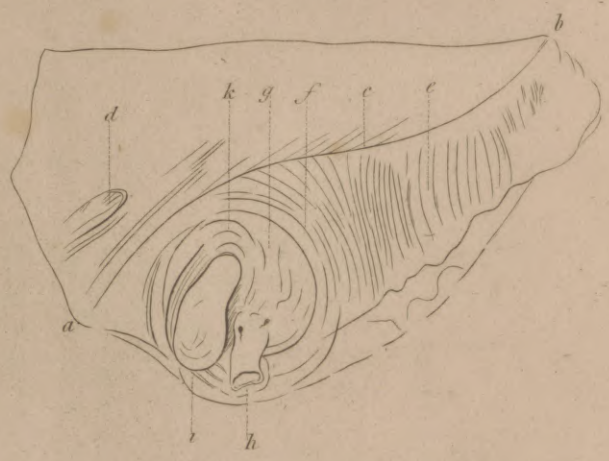


Fig. 3.

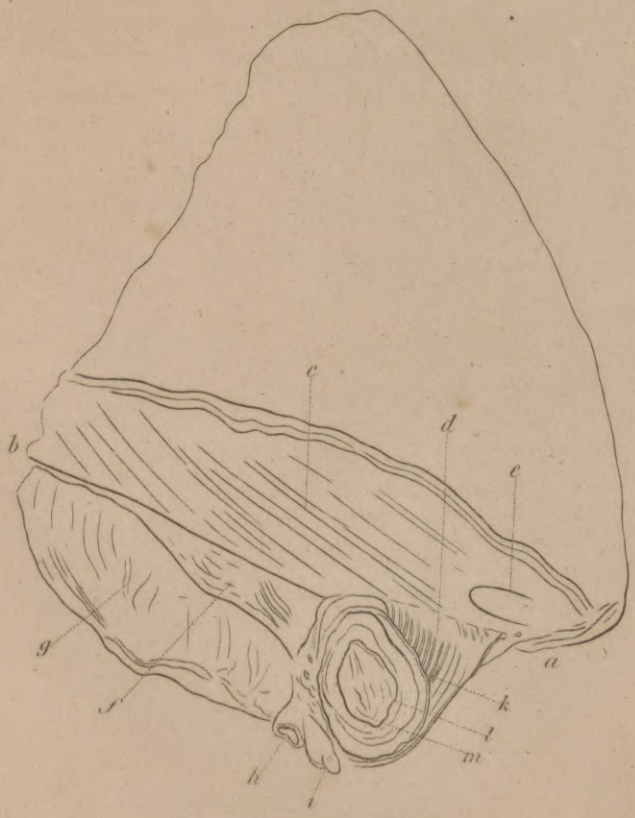
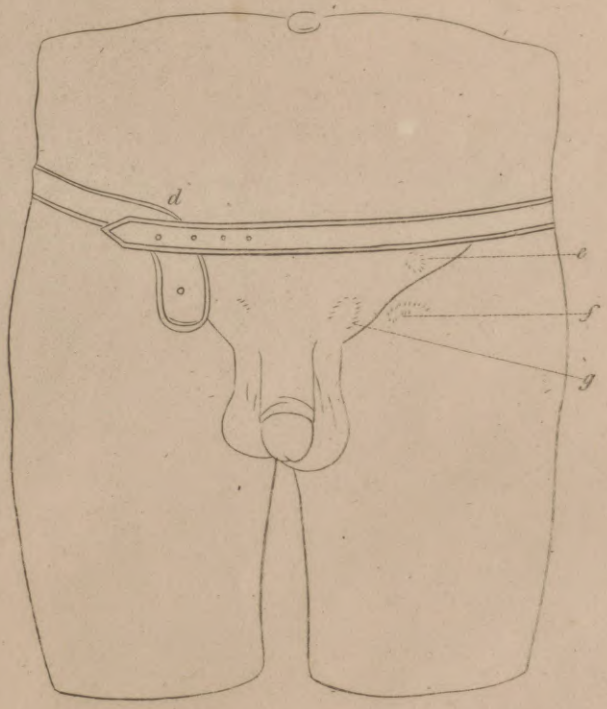
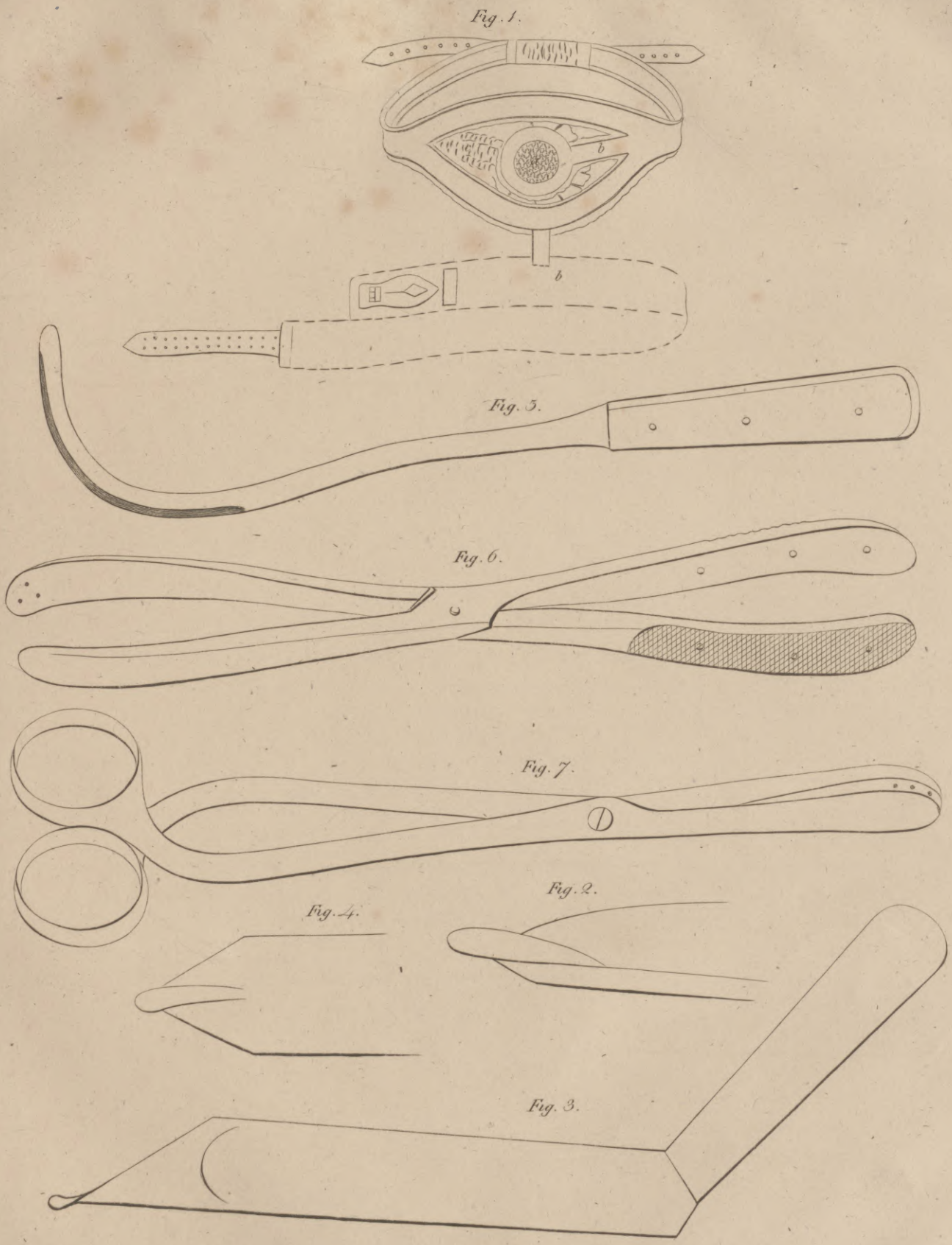


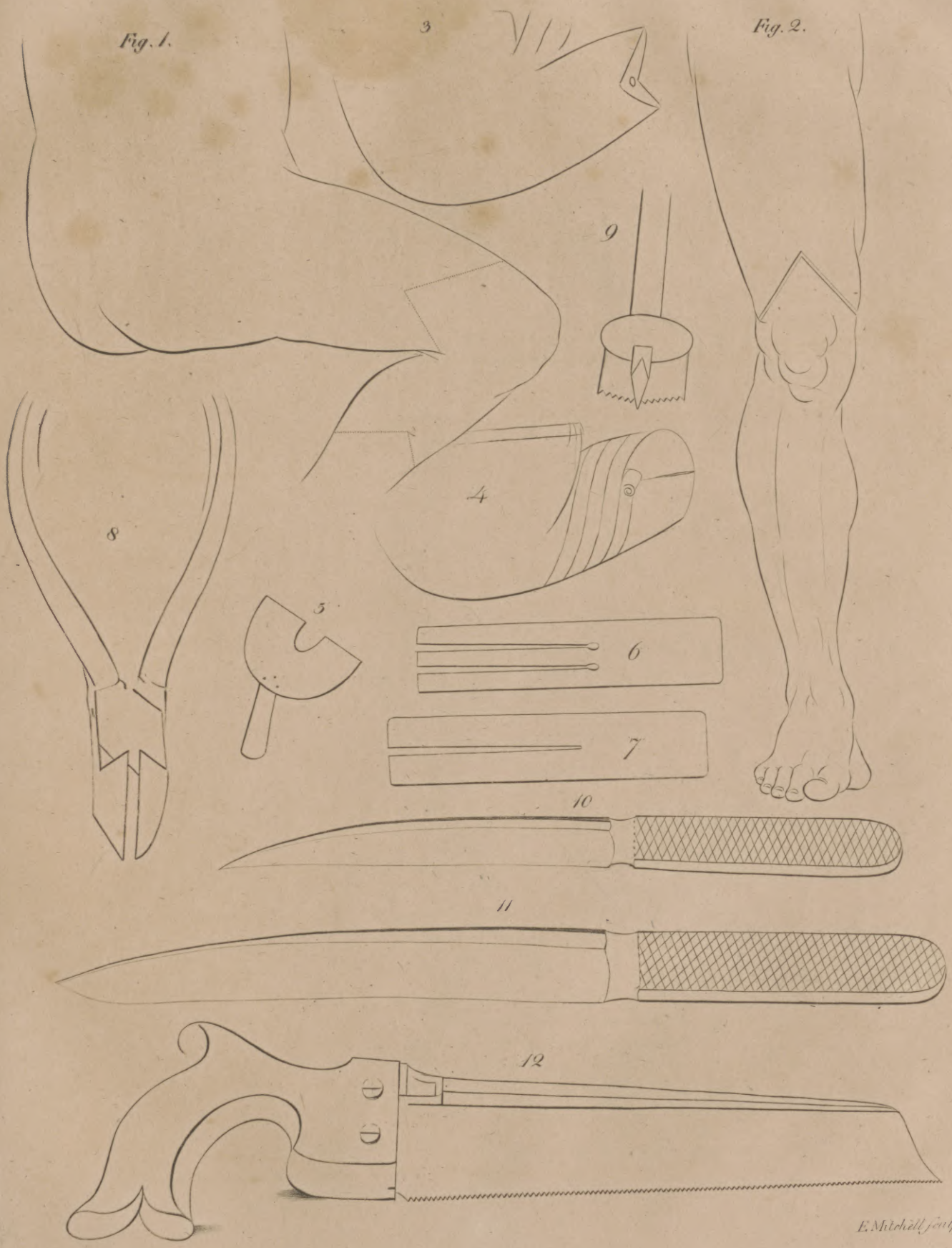
Fig. 4.



E. Mitchell sc.



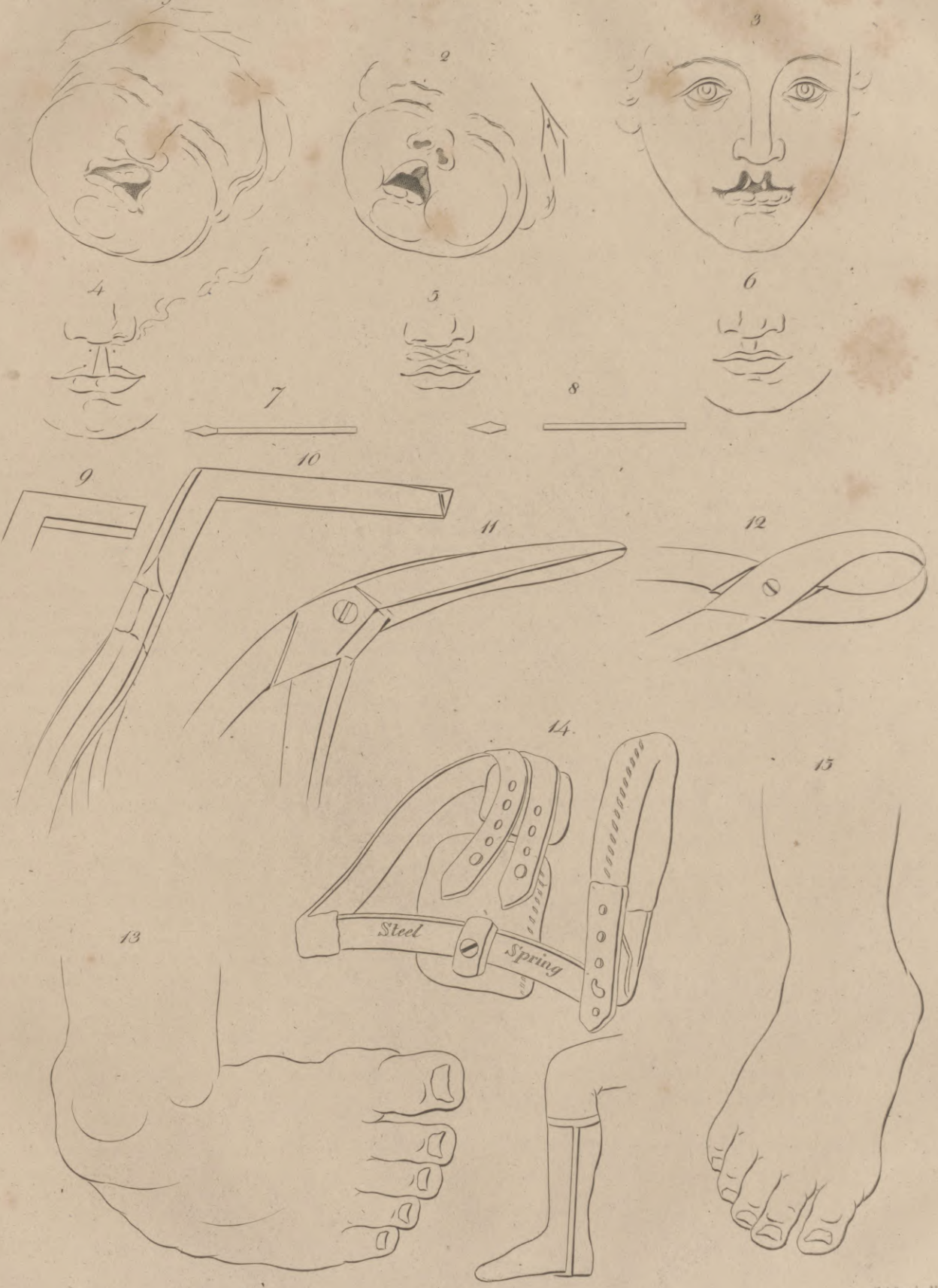
E. Mitchell sculp.t



E. Mitchell sculp.

E. Mitchell sculp.

SURGERY



E. Mitchell, Sculp.

Surinam || Surmullet.

SURINAM, a country of Guiana, which extends about 75 miles along a river of the ſame name, in N. Lat. 6. 16. This river is navigable for 90 miles up the country. The chief productions of Surinam are, wood for dyeing, indigo, cotton, ſugar, tobacco, gums, and different ſpecies of fruit. Prodigious numbers of monkeys infeſt the woods, as well as very large ſerpents. This ſettlement was ceded to the Dutch in 1674, as an equivalent for New York, but was retaken by the Britiſh in 1799. Paramaribo is the capital. N. Lat. 6. 16. W. Long. 56. 0. The productions of this country, when in the hands of the Dutch, yielded, in the year 1775, the ſum of 822,905l. ſterling; and it may be preſumed that the value of theſe will not diminiſh in the hands of its preſent proprietors. Population about 100,000 perſons.

Demerara.—Connected with Surinam we may notice the colony of Demerara, which ſurrendered to the Britiſh troops in 1781; was taken ſoon after by a French frigate, and afterwards recaptured by the forces of Great Britain. Its productions cleared from the port of Demerara from January 1806 to the ſame month of 1807, were 19,337 hogſheads, 474 tierces, and 801 barrels of ſugar; 4722 puncheons and 17 hogſheads of rum; 23,604 bales, two bags of cotton; 12,390,102 pounds of coffee; and 1694 caſks of melaſſes; a produce which we hope will be conſtantly increaſing under the mild and humane conduct of the Britiſh government, by the troops of which it was laſt taken in 1796, under Sir Ralph Abercromby. It is deemed a valuable acquiſition, on account of its flouriſhing condition. Stabroek is the capital of Demerara.

Eſſequibo, on the banks of a river of the ſame name, was firſt founded in 1698, but came into the hands of the Britiſh much about the ſame time with the preceding. The unaccountable neglect ſhewn by Holland towards her colonies rendered them an eaſy conqueſt.

Berbice is ſituated between Demerara and Surinam, containing about 104 ſmall plantations, ſcattered at conſiderable diſtances from each other, the produce of which was long ago valued at 50,000l. ſterling, but may be expected to have a rapid increaſe. Population between 8000 and 9000 perſons of various deſcriptions.

Pomaroon is a country which has a rich and fertile ſoil; yet the inhabitants chiefly confine themſelves to the cultivation of cotton, for the produce of which it is found to be admirably adapted. It is not ſo well fitted to yield good crops of coffee or ſugar, as the land is by far too rich, and ſtrongly impregnated with ſaline matters. In 1799 and 1800; a thirſt for planting cotton was greatly increaſed, as the crops of that article were then the largeſt ever known to be produced in the colonies.

SURMOUNTED, in *Heraldry*, is when one figure is laid over another.

SURMULLET. See MULLUS, ICHTHYOLOGY *Index*.

Surname.

SURNAME, that which is added to the proper name for diſtinguiſhing perſons and families. It was originally diſtinguiſhed from *ſirname*, which denotes the name of the *ſire* or progenitor: thus Macdonald, Robertſon, are ſirnames expreſſing the ſon of Donald, the ſon of Robert. The word *ſurname*, again, ſignified ſome name ſuperadded to the proper name to diſtinguiſh the individual, as Artaxerxes *Longimanus*, Harold *Harefoot*, Malcolm *Canmore*. From this it is evident that every ſirname was a ſurname, though the reverſe was not ſo. In modern times they are confounded; and as there is now no occaſion to preſerve the diſtinction, Dr Johnſon has rejected the word *ſirname* altogether. See NAME.

Surnames were introduced among all nations at an early period, and ſeem to have been formed at firſt by adding the name of the father to that of the ſon. This was the practice among the Hebrews, as appears from the ſcriptures. Caleb is denominated the ſon of Jephunneh, and Joſhua the ſon of Nun. That the ſame thing was cuſtomary among the Greeks, every one who has read the poems of Homer muſt remember. We have an inſtance of it in the very firſt line of the Iliad: Αχιλληος Πηληιαδεω, "Achilles the ſon of Peleus." This is perhaps the general origin of ſurnames, for it has been common among moſt nations (A).

The Romans generally had three names. The firſt called *prænomen* anſwered to our Chriſtian name, and was intended to diſtinguiſh the individuals of the ſame family; the ſecond called *nomen* correſponded to the word *clan* in Scotland, and was given to all thoſe who were ſprung from the ſame ſtock; the third called *cognomen* expreſſed the particular branch of the tribe or clan from which an individual was ſprung. Thus Publius Cornelius Scipio, *Publius* correſponded to our names John, Robert, William; *Cornelius* was the name of the clan or tribe, as Campbell was formerly the name of all the duke of Argyle's clients, and Douglas the name of the retainers of the duke of Hamilton's progenitors. *Scipio* being added, conveyed this information, that Publius, who was of the tribe of the Cornelii, was of the family of the Scipios, one of the branches or families into which that tribe was divided. Reſpecting the three names which were common among the Romans, we may ſay that the firſt was a name and the other two ſurnames.

Du Cheſne obſerves, that ſurnames were unknown in France before the year 987, when the lords began to aſſume the names of their demeſnes. Camden relates, that they were firſt taken up in England, a little before the conqueſt, under King Edward the Confeſſor: but he adds, they were never fully eſtabliſhed among the common people till the time of Edward II.; till then they varied with the father's name; if the father, e. gr. was called *Richard*, or *Roger*, the ſon was called *Richardſon*, or *Hodgſon*; but from that time they were ſettled, ſome ſay, by act of parliament. The oldeſt ſurnames are thoſe we find in Domeſday-Book, moſt of them

(A) This might be ſupported by examples borrowed from many nations. The old Normans uſed *Fitz*, which ſignifies ſon; as Fitzherbert, Fitzſimmons, the ſon of Herbert, the ſon of Simmons. The Iriſh uſed *O*; as O'Neal, the ſon of Neal. The Scotch Highlanders employed *Mac*; as Macdonald, the ſon of Donald. The Saxons added the word *ſon* to the end of the father's name, as Williamſon.

Surname, Surplice.

them taken from places, with the addition of *de;* as Godefridus *de* Mannevilla, Walterus *de* Vernon, Robert *de* Oyly, &c. Others from their fathers, with *filius*, as Gulielmus *filius* Osberni; others from their offices, as Eudo *Dapifer*, Gulielmus *Camerarius*, Gislebertus *Cocus*, &c. But the inferior people are noted simply by their Christian names, without any surnames at all.

Surnames seem to have been introduced into Scotland in the time of William the Conqueror by the English who accompanied Edgar Atheling when he fled into that kingdom. These had their proper surnames, as Moubray, Lovell, Lisle, using the particle *de* before them; which makes it probable that these surnames had been derived from the lands which their ancestors or they themselves had possessed. In Kenneth II.'s time in 800 the great men had indeed begun to call their lands by their own names; but the ordinary distinctions then used were only personal, and did not descend to succeeding generations, such as those employed by the Hebrews and Greeks: For example, *John the son of William;* or the names of office, as Stewart; or accidental distinctions from complexion or station, as Black, White, Long, Short; or the name of their trade, as Tailor, Weaver.

It was long before any surnames were used in Wales, except that of son, as Evan ap Rice, Evan the son of Rice; Evan ap Howel, Evan the son of Howel: but many of them have at length formed separate surnames, as the English and Scots, by leaving out the *a* in *ap*, and joining the *p* to the father's name: thus Evan ap Rice becomes Evan Price; Evan ap Howel, Evan Powel.—We are told, surnames were unknown in Sweden till the year 1514, and that the common people of that country use none to this day; and that the same is the case with the vulgar Irish, Poles and Bohemians.

When we come to inquire into the etymology of surnames, we must allow that many of them were originally significant of the qualities of mind, as Bold, Hardy, Meek; some of the qualities of body, as Strong, Low, Short; others expressive of the trade or profession followed by the persons to whom they were applied, as Baker, Smith, Wright; Butler, Page, Marshal. But the greatest number, at least of the ancient surnames, were borrowed from the names of places. Camden says, that there is not a village in Normandy but has given its name to some family in England. He mentions as examples, Percy, Devereux, Tankervil, Mortimer, Warren, &c. They were introduced with William the Conqueror. Several have been derived from places in the Netherlands, as Gaunt, Tournay, Grandison; and many from the names of towns and villages in England and Scotland, as Wentworth, Markham, Murray, Aberdeen. Many have been formed from the names of animals, as quadrupeds, birds, fishes; from vegetables, and parts of vegetables, as trees, shrubs, flowers, and fruits; from minerals of different kinds. Others are formed from such a variety of accidents that it is impossible to particularize them.

SURPLICE, the habit of the officiating clergy in the church of England. By Can. 58, every minister saying the public prayers, or ministering the sacrament or other rites of the church, shall wear a decent and comely surplice with sleeves, to be provided at the charge of the parish. But by 1 Eliz. c. 2. and 13 and 14 Car. II. the garb prescribed by act of parliament, in the second year of King Edward VI. is enjoined; and this requires that in the saying or singing of matins and even songs, baptizing and burying, the minister in parish churches and chapels shall use a surplice. And in all cathedral churches and colleges, the archdeacon, dean, provosts, masters, prebendaries, and fellows, being graduates, may use in the choir, besides their surplices, such hoods as pertain to their several degrees. But in all other places every minister shall be at liberty to use a surplice or not. And hence in marrying, churching of women, and other offices not specified in this rubric, and even in the administration of the holy communion, it seems that a surplice is not necessary. Indeed for the holy communion the rubric appoints a white ALB plain, which differs from the surplice in being close-sleeved, with a vestment or cope.

Surplice || Surrender.

SURREBUTTER, in *Law*, is second rebutter; or the replication of the plaintiff to the defendant's rebutter.

SURREJOINDER, is a second defence of the plaintiff's declaration, by way of answer to the defendant's rejoinder.

SURRENDER, in *Common Law*, a deed, or instrument, testifying that the particular tenant of lands and tenements, for life or years, doth sufficiently consent and agree, that he who has the next or immediate remainder or reversion thereof, shall have the present estate of the same in possession; and that he hereby yields and gives up the same to him, so that the estate for life or years may merge or drown by mutual agreement of the parties. Of surrenders there are three kinds; a surrender properly taken at common law; a surrender of copyhold or customary estates; and a surrender improperly taken, as of a deed, a patent, &c. The first is the usual surrender, and it is usually divided into that in deed, and that in law.

SURRENDER, in deed, is that which is really made by express words in writing, where the words of the lessee to the lessor prove a sufficient assent to surrender his estate back again.

SURRENDER, in *Law*, is that wrought by operation of the law, and which is not actual.—As if a man have a lease of a farm for life or years, and during the term he accepts a new lease; this act is, in law, a surrender of the former.

SURRENDER of a bankrupt. See *COMMISSION of Bankruptcy*.

SURRENDER of Copyholds is the yielding up of the estate by the tenant into the hands of the lord, for such purposes as are expressed in the surrender: as to the use and behoof of A and his heirs, to the use of his own will, and the like. This method of conveyance is so essential to the nature of a copyhold estate, that it cannot possibly be transferred by any other assurance. No feoffment, fine, or recovery (in the king's courts) hath any operation upon it. If I would exchange a copyhold with another, I cannot do it by an ordinary deed of exchange at the common law, but we must surrender to each other's use, and the lord will admit us accordingly. If I would devise a copyhold, I must surrender it to the use of my last will and testament; and in my will I must declare my intentions, and name a devisee, who will then be entitled to admission.

Blackst. Comment. vol. ii.

SURRENDER

Surrender || Surveying.

SURRENDER of Letters Patent and Offices. A surrender may be made of letters patent to the king, so that he may grant the eſtate to whom he pleaſes, &c. and a ſecond patent for years to the ſame perſon for the ſame thing is a ſurrender in law of the firſt patent. 10 Rep. 66. If an officer for life accept of another grant of the ſame office, it is in law a ſurrender of the firſt grant; but if ſuch an officer take another grant of the ſame office to himſelf and another, it may be otherwiſe.

SURREPTITIOUS. See SUBREPTITIOUS.

SURROGATE, in *Law*, denotes a perſon that is ſubſtituted or appointed in the room of another.

SURRY, a county of England, bounded on the weſt by Berkſhire and Hampſhire, on the ſouth by Suſſex, on the eaſt by Kent, on the north by Middleſex, from which it is parted by the Thames, whence it had the name of *Suth-rey* from the Saxons, *i. e.* the country on the ſouth ſide of the river. It is 38 miles in length from eaſt to weſt, 23 in breadth from north to ſouth, and 112 in circumference. It contains 13 hundreds, 140 pariſhes, of which 35 are vicarages, 13 market-towns, 450 villages, 592,000 acres, and about 269,043 inhabitants. The members ſent from it to parliament are 14, of which two are ſent by each of the following boroughs, viz. Southwark, Bleechingley, Ryegate, Guildford, Gatton, Haſlemere, and two for the county.

Camden's Britannia by Gough.

The air of this county, towards the middle, which conſiſts moſtly of hills and heath, is ſharp, but pure and wholeſome. About the ſkirts, where it is more level, and the ſoil richer, the air is milder, but alſo ſalubrious. In the middle parts the ſoil is barren enough in general; but towards the extremities, and where the country is open and champaign, it is fruitful in graſs and corn, particularly on the ſouth ſide in Holmſdale, in which meadows, woods, and corn-fields, are agreeably intermixed. The ſoil is alſo very fertile along the Thames, eſpecially towards London, where it greatly contributes to maintain plenty in the London markets. It has ſeveral rivers, abounding with fiſh, the chief of which are the Wye, the Mole, and the Wandle.

SURSOLID, or SURDESOLID, in arithmetic, the fifth power of a number, or the fourth multiplication of any number, conſidered as a root.

1 Objects of ſurveying.

SURVEYING. That part of practical mathematics which teaches the method of aſcertaining the limits and extent of lands or eſtates, and of repreſenting theſe in maps or plans, is called *ſurveying*, or *land ſurveying*; but this term, in a more extended ſenſe, includes the valuing of landed property, the buying and ſelling of eſtates, and the dividing or laying out of landed property to the beſt advantage.

Conſidered as a branch of practical mathematics, ſurveying depends for its principles on GEOMETRY and TRIGONOMETRY, and as far as it is confined to the menſuration of plain ſurfaces, has already been conſidered under the article MENSURATION. It is the object of the preſent article to explain and illuſtrate the moſt approved methods of applying theſe principles to practice, and in particular to point out the uſe of the field book, and the mode of ſurveying large eſtates, towns, counties, or ſimilar extenſive tracts of land. We ſhall alſo point out the moſt approved mode of ſurveying ſubterraneous works, as coal-pits, mines, &c. a ſubject which has hitherto been entirely neglected in works of this nature.

Surveying.

2 Preliminary knowledge proper for a ſurveyor.

Before entering on the practical part of the ſubject, it may be proper to mention the previous knowledge which a ſurveyor ought to poſſeſs, and to notice the inſtruments which he is to employ in his operations.

As a ſurveyor has perpetual occaſion for calculation, it is neceſſary that he be familiar with the four firſt rules of ARITHMETIC, and the rule of *Proportion*, both in *whole numbers*, and in *Fractions*, eſpecially *Decimals*, with the nature of LOGARITHMS, and the uſe of *Logarithmic Tables*; and with, at leaſt, ALGEBRAIC *Notation*. As it is his buſineſs to inveſtigate and meaſure lines and angles, and to deſcribe theſe on paper, he ſhould be well acquainted with the elements of GEOMETRY and TRIGONOMETRY, and with the application of theſe principles to the MENSURATION of *Heights*, *Diſtances*, and *Surfaces*. In particular, he ſhould be familiar with the beſt practical methods of ſolving the ordinary geometrical problems, and ſhould be expert in drawing lines and deſcribing figures. He ſhould be acquainted with the principles and practice of LEVELLING; ſhould know ſomething of the principles of OPTICS and MAGNETISM, and ſhould poſſeſs at leaſt a ſmattering of the arts of DRAWING and PAINTING.

3 Inſtruments.

The inſtruments uſually employed in ſurveying, have been enumerated under MENSURATION, vol. xiii. pp. 511, 519, and of theſe the *chain*, the *plane-table*, the *croſs*, and the *theodolite*, are there ſufficiently deſcribed, and the CIRCUMFERENTOR, the COMPASS, LEVELS, the PERAMBULATOR, and PROTRACTORS, are deſcribed, and their uſes explained under their proper heads in the general alphabet of this work.

The moſt ſimple methods of ſurveying, are thoſe in which the chain or the plane-table are employed, and of theſe methods a general idea has been given under MENSURATION. It may be neceſſary in this place to deſcribe a little more at large the uſe of the plane table, as this inſtrument is one of the moſt convenient for ſurveying fields, or other ſmall plots of ground.

4 Practical directions for uſing the plane-table.

In preparing the plane table for uſe, a ſheet of paper that will about cover the plane-table, is to be wetted, then ſpread flat on the table, the marginal frame of which is to be preſſed down on its edges, ſo as to keep it ſmooth and even. On this paper thus ſtretched, the plan of the field or other plot is to be traced in the following manner.

Plate DXXV. Figs. 1. and 2.

Suppoſe it be required to make a plan of a field that has the figure repreſented at A, B, C, D, E, F, fig. 1. Plate DXXV. and in ſuch a ſituation, that all its angles are acceſſible.

The plane table is to be fixed at one of the angles, as at A, in the poſition repreſented at fig. 2. and its ſurface muſt be brought to a horizontal plane. A point is then to be made on the paper with a pencil, as at *a*, to repreſent the point A, where the plane table is ſtationed. Fixing a needle perpendicularly at this point, the index of the table is to be applied to the needle, on that ſide which correſponds with the ſight vanes, and is to be turned round this point, ſliding on the table, till the eye looking through the ſights, perceives a mark ſet up at the point B. A line is now to be drawn from *a* along the edge of the index. In the ſame manner a line is to be drawn from *a*, marking the direction of the ſide AF. Thus the angle *b a f*, (fig. 2.) will be ſimilar to the angle BAF (fig. 1.): the plane table is now to be removed from the point A, to another corner of

Fig. 2.

Surveying. of the field, as B, and a pole or other mark is to be left at A. The length AB is to be measured by the chain, and a proportional length marked off on the paper, in the direction *a*, *b*, from a plotting scale, or scale of equal parts. Proceeding as at first, a line is to be drawn from *b* towards *c*, in the direction of the side BC, and marking the measure of the angle CBA. In this manner, by placing the plane table successively at each corner of the field or plot of ground, the outline figure of the whole will be transferred to the paper, and *a*, *b*, *c*, *d*, *e*, *f*, will be the plan of the field A, B, C, D, E, F.

If it be not convenient to place the plane table at the corners of the ground to be surveyed, the plan may be taken by placing the instrument anywhere within the area, as at E (fig. 3.) in the middle of the field A, B, C, D. In this case we can readily find the direction of the lines EA, EB, EC, ED, and the angles which they form at the point E. By measuring the distances from E to the several angular points, and transferring the proportional distances from the plane scale upon the paper, and then joining the points thus found, there is easily traced the outline of the whole field. Fig. 3.

It may happen that no part of the ground to be measured is accessible, except one line, as the line AE in the space A, B, C, D, E, F, G, (fig. 4.). Fig. 4.

In this case, the plane table is to be fixed at the point A, of the base line AE, and a point made on some part of the paper at pleasure, to represent the station A, and the base line AE is in the usual manner to be ascertained and laid down. Then from the station A, the situation or direction of the points B, C, D, E, F, G, are to be observed through the sights of the index; and lines corresponding to the lines AB, AC, AD, AE, AF, AG, are to be laid down on the paper, but of an indefinite length. When this is done, great attention must be paid to preserve the table steady and perfectly horizontal. The length of the base line AE being determined, the table is now to be removed to the other extremity E, and so disposed that the base line on the paper may be exactly over the base line EA of the field; and proceeding as before, the directions of the lines EA, EB, EC, ED, EF, EG, are to be determined, and corresponding indefinite lines drawn on the paper. The points where these last lines cross those before traced, are to be carefully noted, and the outline joining all these points of section, will correspond to the outline of the plot to be surveyed.

The following general directions to be observed in using the plane table, are given by Dr Hutton. 1. Let the lines on which stations are made be directed towards objects as far distant as possible; and when any such object is set, go round the table and look through the sights from the other end of the index, to see if any other remarkable object be directly opposite; if there be none such, endeavour to find another forward object, such as shall have a remarkable backward opposite one, and make use of it, rather than the other; because the back object will be of use in fixing the table in the original position, either when you have measured too near to the forward object, or when it may be hid from your sight at any necessary station by intervening hedges, &c.

2. Let the said lines, on which the stations are taken, be pursued as far as conveniently can be done; for that will be the means of preserving more accuracy in the work. Surveying.

3. At each station it will be necessary to prove the truth of it, that is, whether the table be straight in the line towards the object, and also whether the distance be rightly measured and laid down on the paper. To know whether the table be set down straight in the line, lay the index on the table in any manner, and move the table about, till through the sights you perceive either the fore or back object; then, without moving the table, go round it, and look through the sights by the other end of the index, to see if the other object can be perceived; if it be, the table is in the line; if not, it must be shifted to one side, according to your judgement, till through the sights both objects can be seen. The aforesaid observation only informs you if the station be straight in the line; but to know if it be in the right part of the line; that is, if the distance has been rightly laid down: fix the table in the original position, by laying the index along the station line, and turning the table about till the fore and back objects appear through the sights, and then also will the needle point at the same degree as at first. Then lay the index over the station point and any other point on the paper representing an object which can be seen from the station; and if the said object appear straight through the sights, the station may be depended on as right; if not, the distance should be examined and corrected till the object can be so seen. And for this very useful purpose, it is advisable to have some high object or two, which can be seen from the greatest part of the ground accurately laid down on the paper from the beginning of the survey, to serve continually as proof objects.

When from any station, the fore and back objects cannot both be seen, the agreement of the needle with one of them may be depended on for placing the table straight on the line, and for fixing it in the original position *. * See *Hutton's Measurer.*

5 Method of measuring offsets.

The foregoing examples are extremely simple, as the bounding lines are straight and regular. Here, therefore, it is not requisite to measure what surveyors call the offsets, or the perpendicular distances between a base line, and the several angles which it subtends. It seldom happens, however, that the work can be carried on in so regular a way, as the bounding lines, even of small pieces of ground, are generally more or less crooked.

Let us suppose A, *l*, *m*, *n*, *o*, *p*, *q*, *r*, (fig. 5.) to be a crooked hedge, or other boundary of a piece of ground, and A B the general base line subtending its several angles. In measuring along this base, when the surveyor comes opposite to any of the bendings or corners of the fence, as at *c*, *d*, *e*, &c. he measures the perpendicular offsets *c l*, *d m*, *e n*, &c. either with the offset staff, or, if they are of considerable length, with the chain. These offsets are to be noted down, as will be explained immediately. Fig. 5.

When the offsets are not very large, their places may be determined pretty exactly by the eye, especially when assisted by laying down the offset staff in a direction perpendicular to the base, and opposite to the angles; but when the offsets are very large, their positions are best determined by the cross, or the plane table, in the following manner. In measuring along A B (fig. 5.), when

Surveying.

when coming nearly oppoſite to *l*, where an offset is likely to ſtand, the croſs or plane-table is there to be fixed, as at *c* in the line A B, and its index is to be turned till the extremities of the baſe A and B can be ſeen through the ſights, both backward and forward. Then looking along the croſs ſights of the croſs, or the croſs line on the index of the plain table, it is eaſy to obſerve whether the ſtation of the inſtrument be exactly oppoſite to the corner. If it be not, the inſtrument muſt be moved backward or forward along the line A B, preſerving the index in the ſame ſituation till the ſtation and the point *l* be exactly oppoſite to each other. The exact meaſured diſtance between A and *c*, is then to be noted and regiſtered, and the meaſure of the offset *c l* is to be ſet down oppoſite to the former, and on the left hand of it, as the work is advancing from A to B. In the oppoſite direction the offsets would of courſe appear on the right hand. In this method, no field book or regiſter is uſually neceſſary, but where the ſurvey is more extenſive, and where the theodolite or other complex inſtruments are required, it is neceſſary to have recourſe to ſome method of regiſtering the ſucceſſive operations.

6 Uſe of the field-book.

The field book employed on theſe occaſions is variouſly conſtructed, according to the taſte or particular object of the ſurveyor. The following is a ſpecimen of the uſual field book, as deſcribed by Dr Hutton.

Offsets and remarks on the left.	Stations, Bearings, and Diſtances.	Offsets and remarks on the right.
	⊙ 1	
	105° 25′	
	00	25 corner.
92	73	
	248	Brown's hedge.
Croſs a hedge, 24	610	35
	954	00
	⊙ 2	
	53° 10′	
	00	00
Houſe corner, 51	25	21
	120	29 a tree.
34	734	40 a ſtile.
	⊙ 3	
	67° 20′	
	61	35
A brook, 30	248	
	639	16 a ſpring.
Footpath, 16	810	
Croſs-hedge, 18	973	20 a pond.

Of the three columns which compoſe this field book, the middle or principal column is for noting down the ſtations, angles, bearings and diſtances, as they are aſcertained, and the columns on the right and left are for the offsets to the right and left of the principal courſe, which are placed againſt their correſponding diſtances in the middle column, as alſo for occaſional remarks or memorandums, to which it may be uſeful to refer in drawing the plan of the ſurveyed lands.

Surveying.

Here ⊙ 1 is the firſt ſtation, where the angle or bearing is 105° 25′. On the left, at 73 links in the diſtance or principal line, is an offset of 92; and at 610 an offset of 24 to a croſs hedge. On the right, at 0, or the beginning, an offset 25 to the corner of the field; at 248 Brown's boundary hedge commences; at 610 an offset 35; and at 945, the end of the firſt line; the 0 denotes its terminating in the hedge. And ſo on for the other ſtations. A line is drawn at the end of every ſtation line, to prevent confuſion.

7 Crocker's field-book.

Various improvements have been made on the field-book, eſpecially by Mr Abraham Crocker, and Mr John Bodham. We ſhall give a ſpecimen of each.

Fig. 6.

Fig. 6. repreſents a page of Mr Crocker's field-book, exhibiting a part of the ſurvey of an eſtate called the Mill Eſtate; the outlines of which were ſurveyed with the theodolite, and the interior parts filled up with the chain. In this book the operations are noted down, ſo as to begin from the foot of the page, carrying them on upwards.

In ſurveying after this method, Mr Crocker adviſes to chooſe two or more eminences, as principal ſtations, and meaſure a general baſe line from one ſtation to the other, noting each hedge, brook, or other remarkable object as it is paſſed by; meaſuring alſo ſuch ſhort perpendicular lines to ſuch bends of hedges as may be near the baſe. From the extremities of this baſe-line, or from any convenient parts of it, the ſurveyor muſt proceed with other lines to ſome remarkable object ſituated towards the ſides of the eſtate, without regarding the angles they make with the baſe-line or with one another, remembering to note every hedge, brook, or other object by which he paſſes. Theſe lines, when laid down by interſections, will with the baſe-line form a principal triangle on the ground to be ſurveyed; ſeveral of which, if neceſſary, being thus laid down, the ſurveyor may proceed to form other ſmaller triangles and trapezoids, on the ſides of the former; and ſo on till the ſeveral encloſures are finiſhed.

This principal triangle being completed, and laid down on the rough plan paper, the parts, exterior as well as interior, are to be completed by ſmaller triangles and trapezoids.

When the whole plan is laid down on paper, the contents of each part of the eſtate may be calculated by the methods already explained under MENSURATION.

In countries where the lands are encloſed with high hedges, and where many lanes or roads paſs through an eſtate, a theodolite may be employed with advantage, in aſcertaining the angles of ſuch lands; and by theſe means an outline of the eſtate may be obtained, and the lane lines ſerve as the baſes of ſuch triangles and trapezoids as are neceſſary to fill up the interior parts.

Plate DXXVI. Fig. 8.

To illuſtrate this method, let us take AB in the plan of the eſtate, (fig. 8.) for the principal baſe line. From B go off to the tree at C, noting down in the field book every croſs hedge as you meaſure on, and from C meaſure back to A, noting down every thing remarkable, as before directed. This figure alſo illuſtrates the method of meaſuring the croſs lines, offsets, and interior parts and encloſures.

8 Rodham's field-book.

Fig. 7. repreſents a page from Mr Rodham's field book. His method of procedure is as follows:—Like Mr Crocker, he begins from the bottom of the page, and writes upwards; denoting the croſſing of fences, by lines

Fig. 7. and 9.

Surveying.

lines drawn acrofs the middle column, or only a part of fuch a line on the right and left oppofite the figures, to avoid confufion, and the corners of fields, and other remarkable turnings in the fences, towards which offsets are taken, by lines joining like the fences, as will be beft feen by comparing the fpecimen at fig. 7. with the plan at fig. 9.

The marks called *a*, *b*, *c*, &c. are beft made in the fields, by making a fmall hole with a fpade, and placing there a chip or fmall piece of wood, with the particular letter marked on it, to prevent one mark being taken for another, on any return to it, though in general the name of a mark is very eafily feen, by referring in the book to the line in which it was made. After the fmall Italic letters have been gone through, the capitals may be next employed, and the Roman letters afterwards, and fo on. Perhaps it would be preferable to diftinguifh the marks by figures.

The letters in the left hand corner at the beginning of each line, denote the mark or place meafured *from;* and that at the right hand corner of the end, is the mark meafured *to*. But when it is not convenient to go exactly from a mark, the place meafured from is defcribed *fuch a diftance* from *one mark* towards *another;* and where a mark is not meafured to, the exact place is afcertained by writing, turn to the right or left hand, *fuch a diftance* to *fuch a mark*, it being always underftood that thofe diftances are taken in the chain line.

The characters ufed are ⌈ for *turn to the right hand*, ⌉ for *turn to the left hand*, and ʌ placed over an offset, to fhew that it is not taken at right angles with the chain line, but in the line with fome ftraight fence, being ufed chiefly when croffing their directions, and is a better mode of afcertaining their true places than by offsets at right angles.

When a line is meafured whofe pofition is determined, either by former operations (as in the cafe of producing a given line or meafuring from one known place or mark to another) or by itfelf (as in the third fide of a triangle) it is called a *faft line*, and a double line is drawn acrofs the book at the conclufion of it; but if its pofition be not determined (as in the fecond fide of a triangle) it is called a *loofe line*, and a fingle line is drawn acrofs the book. When a line becomes determined in pofition, and is afterwards continued, a double line is drawn half through the book.

When a loofe line is meafured, it becomes abfolutely neceffary to meafure fome line that will determine its pofition. Thus, the firft line *a b*, (fig. 9.) being the bafe of a triangle, is always determined, till the third fide *j b* is meafured; then the triangle may be conftructed, and the pofition of both is determined.

Fig. 9.

At the beginning of a line to fix a loofe line to the mark or place meafured from, the fign of turning to the right or left hand muft be added (as at *j* in the third line); otherwife a ftranger, when laying down the work, may as eafily conftruct the triangle *h j b*, on the wrong fide of the line *a h*, as on the right fide; but this error cannot be committed, if the fign above named be carefully obferved.

In choofing a line to fix a loofe one, care muft be taken that it does not make a very acute or obtufe angle, as in the triangle *p* B*r*; by the angle at B being very obtufe, a fmall deviation from truth would make the error at B when conftructed very confiderable; but by conftructing the triangle *p Bg*, fuch a deviation is of no confequence.

When the words *leave off* are written in the field book, it is to fignify that the taking of offsets is from thence difcontinued; and of courfe fomething is wanting between that and the next offset *.

* *Hutton's Math. Dict.* art. *Surveying.*

The general ufe of the theodolite in meafuring feparate plots, has been defcribed under MENSURATION. The following practical directions for the ufe of this inftrument are given by Mr Crocker, and apply to his field book, exemplified at fig. 6. and the plan at fig. 10.

Practical directions for the ufe of the theodolite.

Suppofe the furveyor to plant his theodolite in the road ⊙1, and having duly adjufted it, by placing its head exactly horizontal, by the levels; and fetting the index part of the limb exactly at 360°; and by moving the whole head about till 360° in the compafs-box comes to the line in the north end of the needle; there fixing all faft, by the fcrew under the head, between the legs, he will have his inftrument completely adjufted.

The theodolite thus adjufted, the furveyor fends one of his affiftants forward as far as he can conveniently fee how to meafure a ftraight line, as at ⊙2. Taking then his angle of obfervation, by his telefcope, to the picket at that ftation, he finds it to be 69° from the north part of his magnetic meridian line towards the eaft, which he enters in his field book, noting it with NE, as a memorandum on which fide of the magnetic meridian it lies. He is now to faften his limb to the other part of the head, by a fcrew for that purpofe.

Fig. 10.

His chain-man having laid the chain in the direction to the picket ⊙2, in order to meafure the line, he makes fuch offsets to the right and left, in this firft chain's length, as may be neceffary. At his firft ftation, he finds that on the right, the general road fence is 30 links, and alfo a nook of 40 links more, and 30 links broad; and that on the left of his ftation he has an offfet of 10 links, all of which he muft note in his field book. Proceeding forward on this line, he finds at 300 he has an offset of 25 on the right, where is a gate, which he has to notice; and, on the left 20, which determines the breadth of the road at that fpot. At 400, he will find 10 on the right and 20 on the left to be the breadth; and at 700 (the end of the line) he will find 35 on the right and 15 on the left to be the breadth of the road; where alfo he will find a fmall road branching off to the right. Thus the firft ftation line is finifhed.

To this fpot (which is his fecond ftation) he brings the theodolite; and after fetting it level, he unlocks the under fcrew, and turns the whole head about, till, through the telefcope, he fees the back picket or ftation ftaff to be cut by the crofs hairs. Here, again, locking the head of his theodolite firm by the under fcrew, he muft unfcrew the limb, and turn it about, till through the telefcope, he has a view of the picket at ⊙3; the bearing of which he will find to be 253° 10′ from the north to the eaftward, which he will enter in his field book. Meafuring on from ⊙2, towards ⊙3, he will find at 130 links, that he is come to a turnpike, where the breadths at the right and left are 30 and 15. At 200, he has an offset of 15 on the left, and a break off at the right of another road, at 25 from his line, with two other offsets, as expreffed in the field book. It

muft

Surveying. must be noted where this road leads to. At 265 he has offsets of 30 on the left, and 20 on the right. Thus ends the second station line.

Now bringing his instrument to ⊙3, he is to adjust it in the manner before directed at ⊙2; and turning the limb about towards the picket forward, he will find the angle of bearing to be 57° 45′, still from the north to the eastward. At 20 links he will be opposite to a cross hedge on the left, belonging to the estate he is surveying. At 293 he ends the line of this station, where the offsets are 5 and 35, as noted in the field book.

Coming next to ⊙4, and having adjusted his theodolite, he finds his next angle = 226° NE. At 120 his offsets are 20 and 15. At 410, they are 15 and 30, where, on the left, is a cross hedge, of a backward direction. At 480 his offsets are 5 and 25, where is another cross hedge. At 750, is a break-in of the fence, and the offsets are 30+15 on the left, and 10 on the right. At 1050, the offsets are 20 on each hand, and another cross hedge on the left. At 1150 are offsets of 20 and + 20, where stands a house. At 1300, the offset of 30 on the right terminates the house; and at 5 on the left is a cross hedge, of a backward direction. 1350 ends this line, where roads diverge to the right and left.

At ⊙5, the instrument being adjusted, the angle is found to be 284° 50′ nearly W. At 50, his offset to the hedge is 15; at 220 it is also 15, where is a cross hedge, the other end of which was noted at 1050 in the last line. At 320 the offset is 25; at 350, the end of the ⊙, the distance from the fence is 15.

At ⊙6, the bearing is 305° 35′ N. W. At 130 the offset is 30, where a cross hedge goes off to the point which was noted at 750, in the line from ⊙4 to ⊙5. At 160 the line is nearly close to the fence, ending at 210.

At ⊙7, the angle forward is 106° 25′ N. W. The line is 143 long, with an offset at the end of 15.

At ⊙8 the bearing is 269° 20′ N. W. At 100 and at 300 the offsets are 15 and 10.

The bearing at ⊙9 is 70° 45′ S. W. At 30 the measurer finds it expedient to cross the fence, and proceed within the bounds of the estate. At 90 he has an offset of 30 to the right, where he crosses a hedge. At 880 he crosses another hedge, having there an offset of 20: at 940 is an offset of 50. At 990 he again crosses the hedge; and at 1020 is an offset of 20 to the left: at 1040 he again crosses the hedge: at 1080 he comes to the corner of the farm house; and 1165 ends his line, where is a small curve at the right.

At ⊙10, the bearing is 204° S. W. At 70 is an offset of 5 at the right: at 200 is 15 at the left, and a cross hedge: at 600 is 25 on the left, and 20+15 on the right: 690 ends the line, where are 15 on each side, where there is also a cross hedge.

The angle at ⊙11 is 355° 30′ S. E. At 280 is an offset of 30 on the right, and 10 with a cross hedge on the left: at 400 is an offset of 30, and another cross hedge on the left; and 470 ends the line, where are offsets of 10 and 20 on the right and the left.

At ⊙12 the angle is 155° S. E. At 60 is a cross hedge: at 219 the offsets are 10 and 15; and at 229 he comes to close his work at ⊙1, from which he set out.

Having thus taken the circuit of this estate, the measurer must proceed to plot the same on paper, with some convenient scale *. Surveying. * *Crocker's Elements.* p. 235.

10 Description and use of the plotting-scales. Figs. 11. and 12.

The scale usually employed for this purpose is that called the *plotting scale*, *plane scale*, or *scale of equal parts*, represented at fig. 11. and 12.

This instrument contains different scales or divided lines, on both sides. There are on one side a number of plane scales, or scales of equal divisions, each of a different number to the inch, and also scales of chords for laying down angles, and sometimes the degrees of a circle marked on one edge, answering to a centre marked on the opposite edge, by which means it also answers the purpose of a protractor. There are several diagonal scales on the other side, of different sizes, or different dimensions to the inch, serving to take off lines expressed by numbers to three dimensions, as units, tens, hundreds, as also a scale of divisions which are the 100th parts of a foot. The most useful of all the lines which can be laid down on this instrument, though not always done, is a plane scale on the two opposite edges, made thin for the purpose. This line is very useful in surveying; for by laying down the instrument on paper, with its divided edge along a line whereon several distances are to be laid off, for the places of offsets, &c.; these distances are all transferred at once from the instrument to the line on the paper, by making small points or marks against the respective divisions on the edge of the scale.

11 Directions for plotting or planning.

The business of *plotting* or laying down a plan of an estate from the memoranda of a field book, is a very important branch of the surveyor's office. This will best be understood by an example, which we shall take also from Mr Crocker. It is adapted to the page of his field book, already alluded to; and the plan, when completed, is seen at fig. 10.

The vellum or paper on which the plan is to be drawn, being smoothly laid on a drawing board, the magnetic meridian is to be represented by a line drawn from the bottom to the top.

A point is to be made about the middle of this line, on which is to be laid the centre of the circular protractor, placing the straight edge in such a manner as to coincide with the said meridian line: draw a pencil line around at the edge of the protractor.

The protractor being thus placed, and firmly fixed by means of pins in that position, or by a lead weight, the field book is to be inspected for the quantity of the angle at ⊙1, which, in the present case is stated at 69° north-easterly. This degree is then to be looked for on the circular edge of the protractor, and a mark made on the paper with a fine plotting-pin, at that number, which is to be marked 1, denoting ⊙1.

The field-book is then to be inspected for the ∠ at ⊙2, which in this case is 253° 10′, where a mark is to be made as before.

A similar process is to be followed with all the other angles, till the surveyor comes to the close on ⊙1.

All the angles being thus marked off, the protractor is to be removed.

The place where the beginning of the work should be placed is then to be considered, that the whole may come within the compass of the paper laid down; where a mark is to be made, noting it as ⊙1, the beginning of the plot.

The fore edge of the parallel ruler is then laid from the

Surveying. the central point where the protractor lay, to the mark on the pencilled circle denoting ⊙1. The fore edge of the parallel ruler is next moved till it touch the point determined on for the beginning of the plot, from which a pencil line in the direction from the north to the eastward, is drawn, about the length of the whole line of this ⊙=760.

A feather-edge scale is applied to this pencil or obscure line, the 0 division of it at the beginning, marking off every progressive number where any offsets have been made, as at 300, 400, and 760.

The scale is then turned across the line (by some cross division), and the offsets on each side of the station line are pricked off. At 0, or ⊙1, the field book shews that on the left hand, at 10 links, is the boundary line of that side, where there is likewise a small road branching off. The offset on the right hand is 30, which, with + 40, goes to the extent of a small corner, also 40 links in breadth. At 300 on the left there is an offset of 20, and on the right another of 25, where there is also a gate to be noticed. At 760 there is an offset on the left of 15; and on the right, one of 35, where a small roadway branches off. All these offsets are to be pricked off as the surveyor proceeds. The boundary lines are drawn through these offset points, and in this manner the first station is completed.

The parallel ruler is then laid from the centre to the angular point of ⊙2; the limb of it is moved till it touches the end of the last station line, from which another obscure line is drawn, from the north-easterly, as noted in the field book.

The edge of the scale is then applied as before, and the numbers 30, 200, and 265 are pricked off. There is a toll gate at 30 links, and a lane of 30 links broad, going off at an acute angle. At 265, the end of this station, the offsets are 30 and 10.

The line from ⊙3 is then laid off, as before directed, north-easterly, and the numbers 20 and 293 are pricked off. Opposite to 20 is a hedge branching off to the left, and at 293 the offsets are 35 and 5.

The line north-easterly is laid off from ⊙4, and the numbers on that line are pricked off as they appear in the field book, and the offsets are made as follows. At 120, 15 and 20 are set off; at 410 are 30 and 15, where two hedges branch off nearly in the direction of the side sketches. At 480 the offsets are 25 and 5, where there is a cross hedge on the left. At 750 on the left, is 30+15 with a cross hedge, and on the right 10. At 1050 on the left, is 20 with a cross hedge, and 20 on the right. At 1150 on the right, is 20+20, where stands a house. At 1300 on the left, is 5 with a cross hedge; on the right is 30, with a road branching from it: 1350 completes this line.

At ⊙5 the work takes another direction, and goes backward towards the west. The ruler is laid from the centre to this station, and an obscure line drawn in the direction mentioned. The distances and offsets are pricked off as in the field book. Here are offsets on one side only, not being in a road way.

At ⊙6 set off the line south-westerly, pricking off the distances and offsets as in the field-book.

This specimen is sufficient to give a complete idea of the practice of plotting; and more would be only a tedious repetition. It must, however, be observed, that the accuracy and facility of the work greatly depend on the judgement and care exercised in keeping a correct and clear field-book. Surveying.

When a circuit is plotted off, the measurer must fill up the interior, by separately completing the measure of each field with the chain, so that they may be laid down on the plan in their proper situations and dimensions. The lines taken with the theodolite will here be of great service, as the base lines of a number of interior angles.

The surveyor having thus on paper, a representation of the estate, must draw such measuring lines on it, as will enable him to calculate the content of each field separately. Having made out a fair plot of his work, another line must be drawn for the true meridian, to the eastward of the former, according to the variation of the magnetic needle, where the estate lies. On this true meridian line may be placed any device whatever, as a north point. A title must also be given to the map, a scale drawn of the proportion used in the plotting, and a border to the whole *.

*See *Crocker's Elements*, p. 240.

Having thus explained the general practice of surveying according to the latest improvements, we shall shew how a surveyor is to proceed in measuring and planning counties and towns.

12 Method of surveying counties or districts.

To survey a County or large Tract of Land.—1. Chuse two, three, or four eminent places for stations, such as the tops of high hills or mountains, towers, or church steeples, which may be seen from one another, and from which most of the towns, and other places of note, may also be seen. And let them be as far distant from each other as possible. On these places raise beacons, or long poles, with flags of different colours flying at them, so as to be visible from all the other stations.

2. At all the places which are to be set down in the map, plant long poles with flags at them of several colours, to distinguish the places from each other, fixing them on the tops of church steeples, or the tops of houses, or in the centres of smaller towns.

It is not necessary to have these marks at many places at once, as suppose ten at a time. For when the angles have been taken at the two stations, to all these places, the marks may be removed to new ones, and so successively to all the places required. These marks being set up at a convenient number of places, and such as may be seen from both stations, go to one of these stations, and with an instrument for taking angles, standing at that station, take all the angles between the other station, and each of these marks, observing which is blue, which red, &c. and on which hand they lie; and set all down with their colours. Next go to the other station, and take all the angles between the first station, and each of the former marks, and set them down with the rest, each against those corresponding with the same colour. If practicable, the angles may also be taken at some third station, which may serve to prove the work, if the three lines intersect in that point where any mark stands. The marks must be allowed to remain till the observations are finished at both stations, and then they must be taken down, and set up at fresh places. The same operations must be performed at both stations, for these fresh places, and the like for others. The instrument for taking angles must be exceedingly accurate, made on purpose with telescopic sights,

Fig. 1.

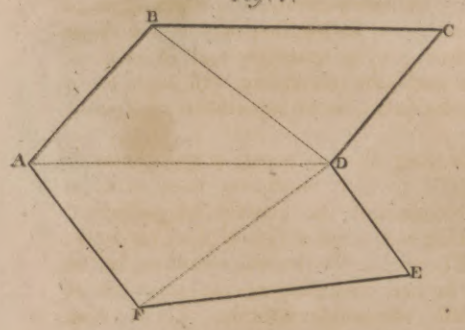


Fig. 2.

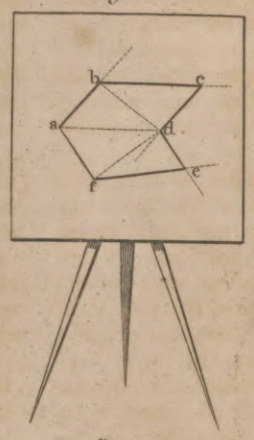


Fig. 4.

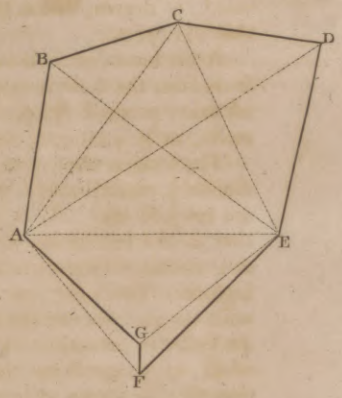


Fig. 5.

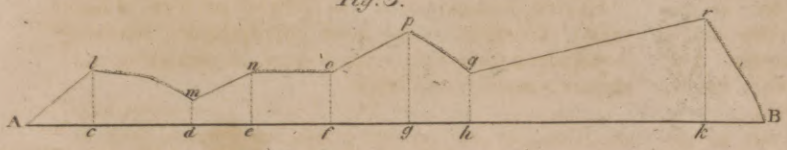


Fig. 3.

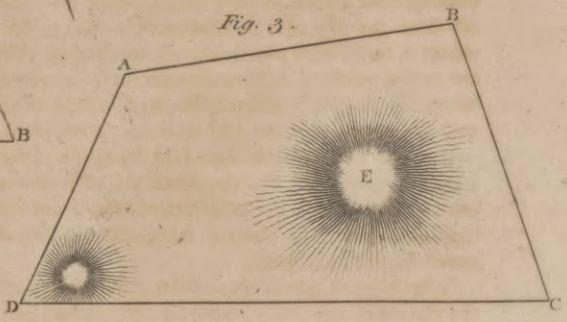


Fig. 6.

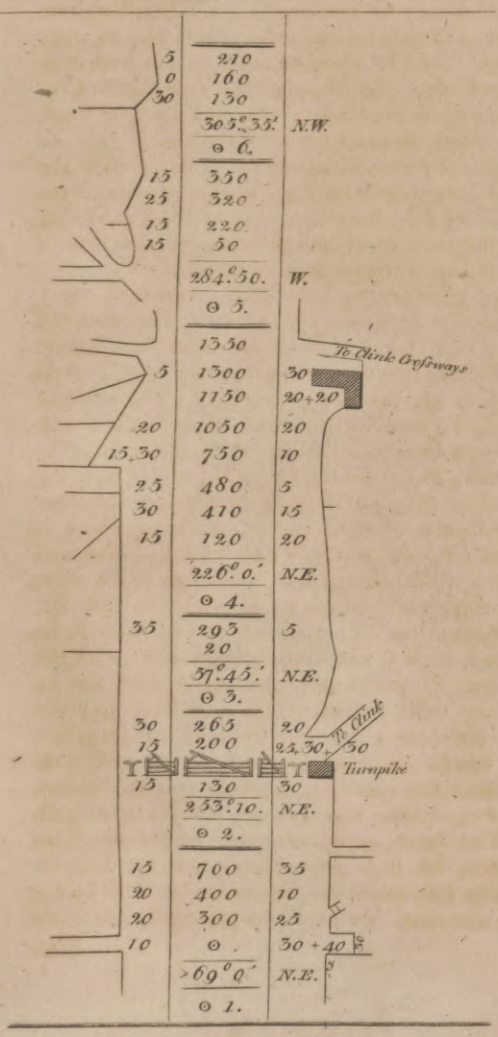
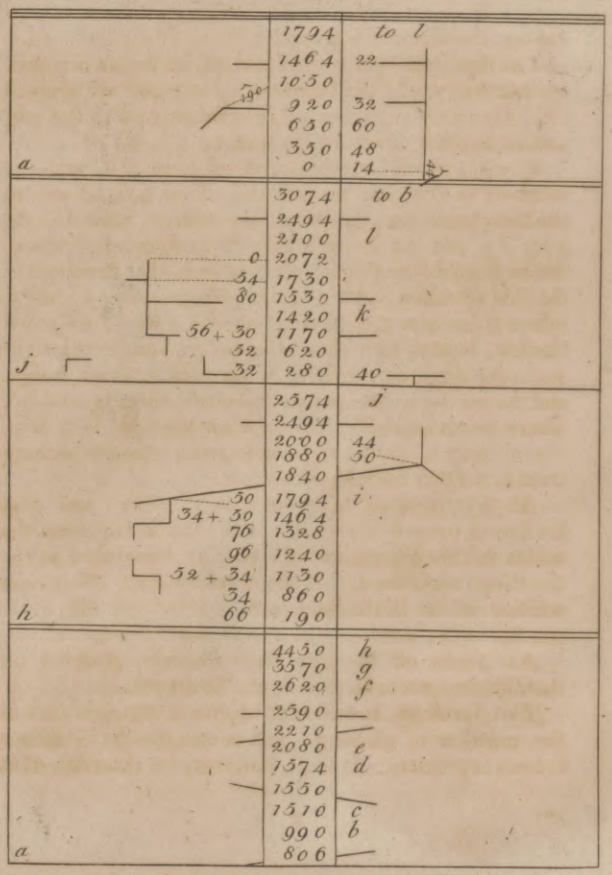


Fig. 7.



W. Archibald sculpt.

Fig. 8.

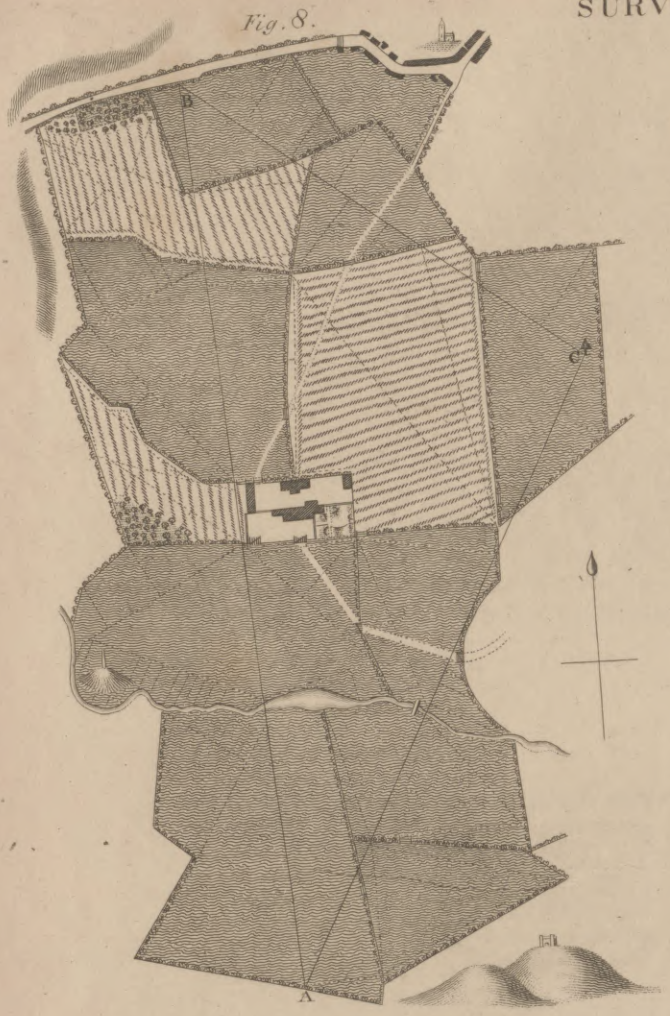


Fig. 9.

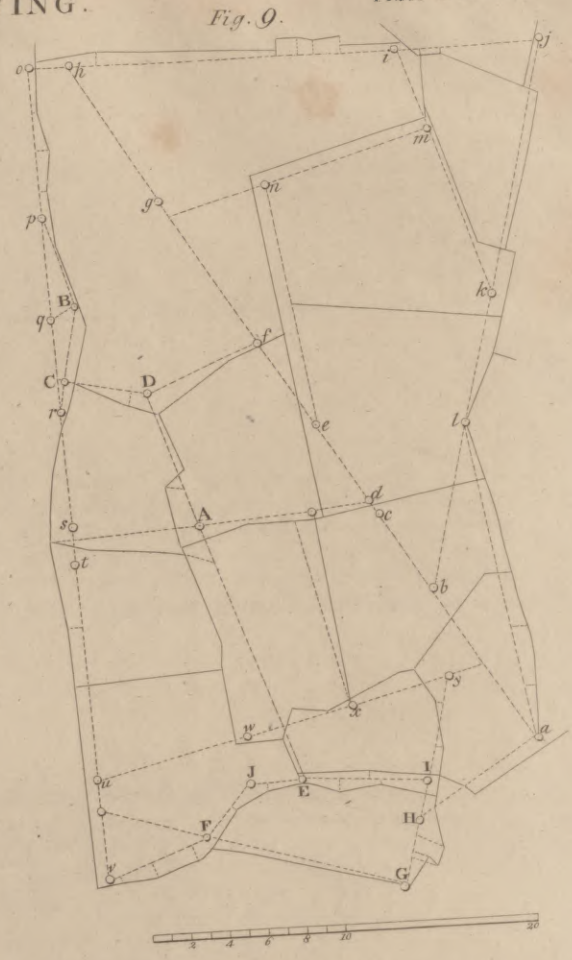
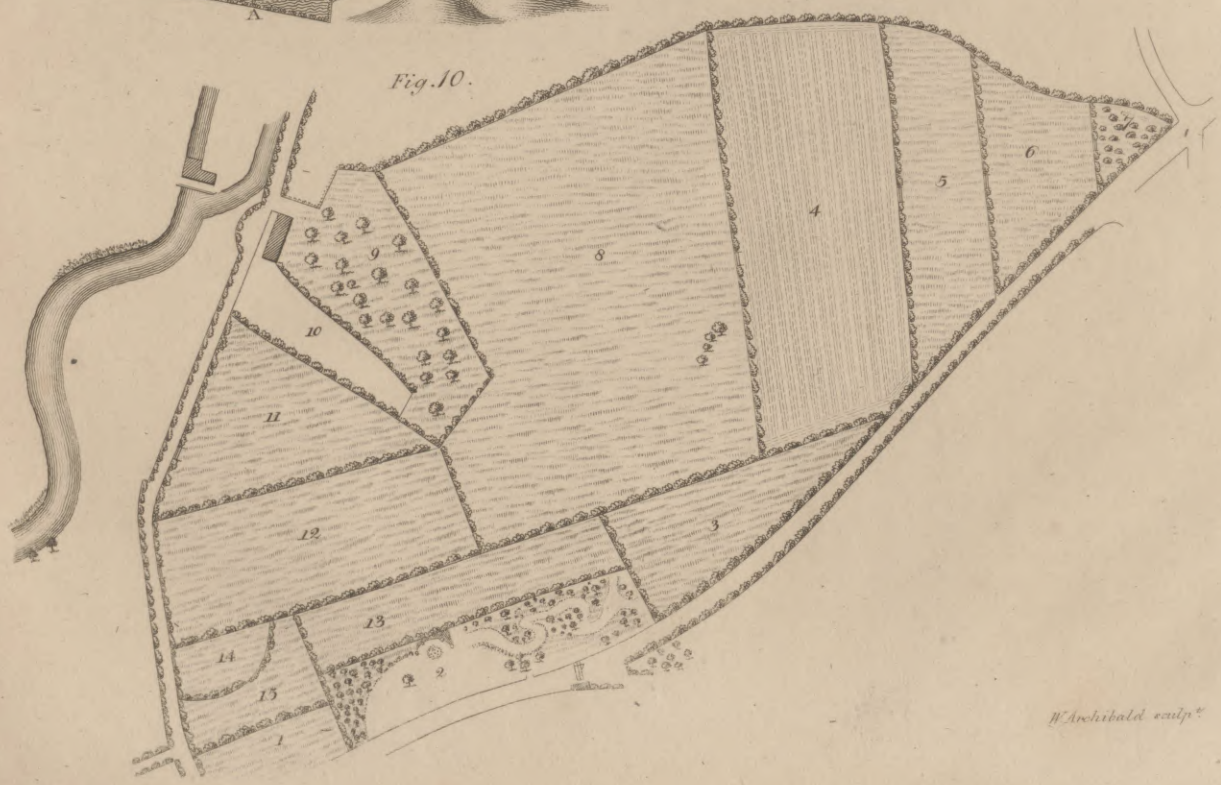


Fig. 10.



W. Archibald sculp.

Fig. 11.

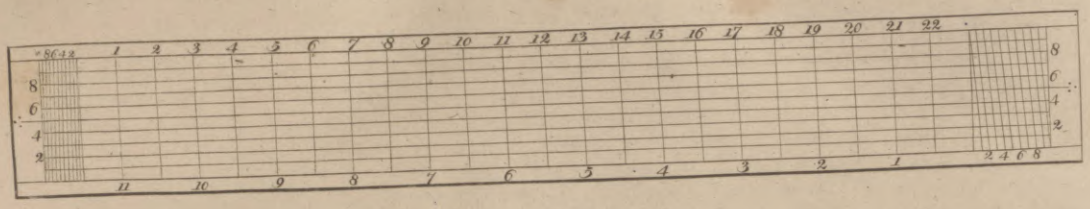


Fig. 12.

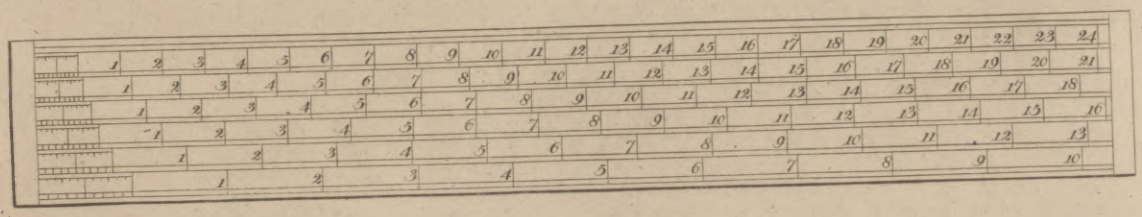


Fig. 13.

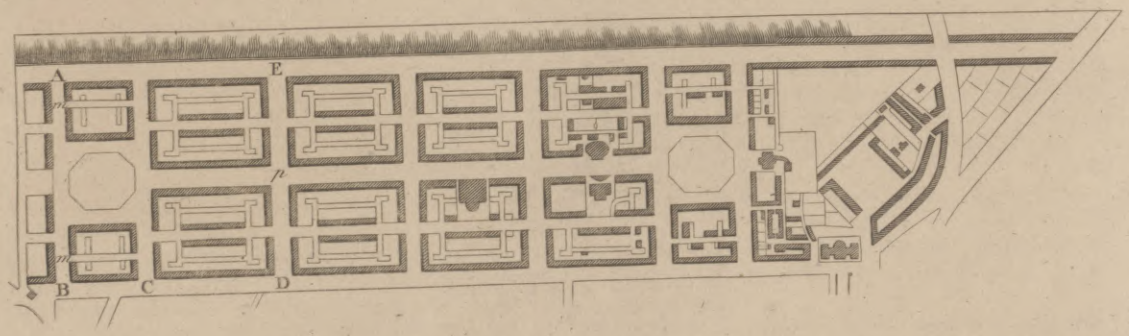


Fig. 14.

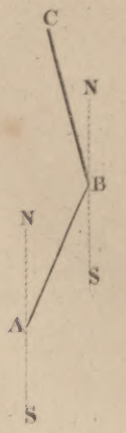


Fig. 15.

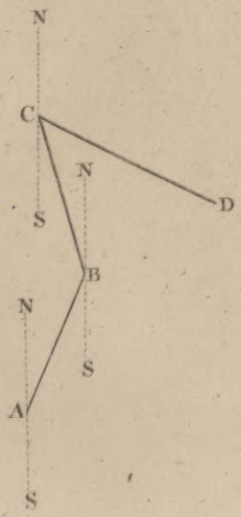


Fig. 16.

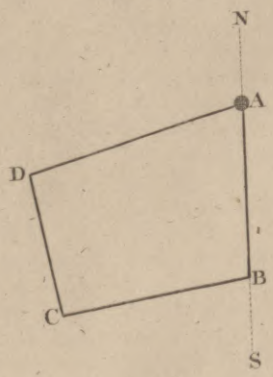
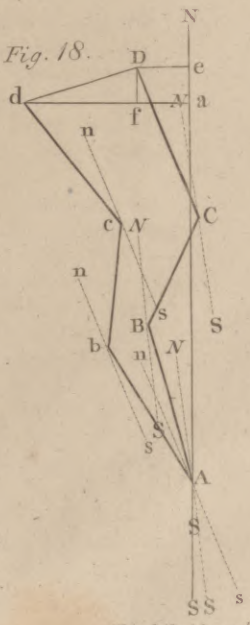


Fig. 17.

Fig. 18.



W. Archibald sculpt.

Surveying. ſights, and of three, four, or five feet radius. A circumferentor is reckoned a good inſtrument for this purpoſe.

3. Though it be not abſolutely neceſſary to meaſure any diſtance; becauſe a ſtationary line being laid down from any ſcale, all the other lines will be proportional to it; yet it is better to meaſure ſome of the lines, to aſcertain the diſtances of places in miles: and to know how many geometrical miles there are in any length; and from thence to make a ſcale for meaſuring any diſtance in miles. In meaſuring any diſtance, it will not be exact enough to go along the high roads, on account of their turnings and windings, and ſcarcely ever lying in a right line between the ſtations, which would cauſe endleſs reductions, and create trouble to make it a right line, for which reaſon it can never be exact. But a better way is to meaſure in a right line with a chain, between ſtation and ſtation, over hills and dales, or level fields, and all obſtacles. Only in caſes of water, woods, towns, rocks, banks, &c. where one cannot paſs, ſuch parts of the line muſt be meaſured by the method of inacceſſible diſtances; and beſides, allowing for aſcents and deſcents, when we meet with them. A good compaſs that ſhews the bearing of two ſtations, will always direct to go ſtraight, when the two ſtations are not ſeen; but when a ſtraight progreſs can be made, offsets may be taken to any remarkable places, likewiſe noting the interſection of the ſtationary line, with all roads, rivers, &c.

4. From all the ſtations, and in the whole progreſs, care muſt be taken to obſerve ſea coaſts, the mouths of rivers, towns, caſtles, houſes, churches, windmills, watermills, trees, rocks, ſands, roads, bridges, fords, ferries, woods, hills, mountains, rills, brooks, parks, beacons, ſluices, floodgates, locks, &c. and in general every thing remarkable.

5. When the firſt and main ſtation lines are done, which command the whole country, inner ſtations are then to be taken at ſome places already determined, which will divide the whole into ſeveral partitions, and from theſe ſtations may be determined the places of as many of the remaining towns as poſſible. If any remain in that part, more ſtations may be taken at ſome places already determined, from which the reſt may be determined. Proceeding thus through all parts of the country, ſtation may be taken after ſtation, till all that are required be determined. In general, the ſtation diſtances muſt always paſs through ſuch remarkable points as have been formerly determined by the preceding ſtations.

6. The poſition of the ſtation line meaſured, or the point of the compaſs on which it lies, muſt be determined by aſtronomical obſervation. Hang up a thread and plummet in the ſun over ſome part in the ſtation line, obſerving when the ſhadow runs along that line, and at that moment take the ſun's altitude; then having his declination, and the latitude, the azimuth will be found by ſpherical trigonometry. The azimuth is the angle which the ſtation line makes with the meridian, and therefore a meridian may eaſily be drawn through the map; or a meridian may be drawn through it by hanging up two threads in a line with the pole ſtar, when due north, which may be known from aſtronomical tables. Or thus: Obſerve the ſtar Alioth, or that in the rump of the Great Bear, being that next the ſquare; or elſe Caſſiopeia's hip; obſerving by a line and plummet when either of theſe ſtars and the pole ſtar comes into a perpendicular; and at that time they are due north. Therefore two perpendicular lines being fixed at that moment, towards theſe two ſtars, will give the poſition of the meridian.

13 Method of ſurveying towns.

A Town or City may be ſurveyed with any of the inſtruments for taking angles, but beſt of all with the plane table, where every minute part is drawn while in ſight. It is alſo proper to have a chain of 50 feet long, divided into 50 links, and an offset-ſtaff of 10 feet long.

Begin at the meeting of two or more of the principal ſtreets through which the longeſt proſpect may be had, to get the longeſt ſtation lines. Having there fixed the inſtrument, draw lines of direction along thoſe ſtreets, uſing two men as marks, or poles ſet in wooden pedeſtals, or perhaps ſome remarkable places in the houſes at the farther ends, as windows, doors, corners, &c. Meaſure theſe lines with the chain, taking offsets with the ſtaff, at all corners of ſtreets, bendings, or windings, and to all remarkable objects, as churches, markets, halls, colleges, eminent houſes, &c. Then remove the inſtrument to another ſtation along one of theſe lines, and there repeat the ſame proceſs as before, and ſo on till the whole be completed.

Thus, in fig. 13. (part of the New Town of Edinburgh) fix the inſtrument at A, and draw lines in the direction of all the ſtreets meeting in that place, and meaſure AB, noting the ſtreet on the left at *m*. At the ſecond ſtation B, draw the directions of the ſtreets meeting there, and meaſure CD. Do the ſame at D, and meaſure DE, noting the place of the croſs ſtreets at *p*. In this manner go through all the principal ſtreets. This being done, proceed to the ſmaller and intermediate ſtreets; and laſtly to the lanes, alleys, courts, yards, and every part which it may be deemed expedient to repreſent *.

* See *Hutton's Math. Dict.* art. *Surveying.*

14 Subterraneous ſurveying.

We ſhall conclude this article with a few practical remarks on *ſubterraneous ſurveying*, or the method of ſurveying mines, and other works below ground, taken chiefly from Mr. Fenwick's work on *ſubterraneous ſurveying*, lately publiſhed.

The inſtruments employed in ſurveying under ground, are the circumferentor, the chain (in coal mines) containing 100 links, and an inſtrument for taking the angles of elevation or depreſſion, to reduce the meaſurements to horizontal diſtances, where the lines are not level. In lead mines, they ſometimes employ a cord, divided into 10 feet, inſtead of a chain.

In conducting a ſubterraneous ſurvey, the inſtrument uſed is placed where the ſurvey is intended to commence, and a perſon goes forward in the direction of the line to be ſurveyed, holding a lighted candle in his hand, to the remoteſt point at which his light can be ſeen through the ſights of the inſtrument; its bearing is then taken by the circumferentor, and noted down in the ſurvey book. The ſurveyor then proceeds to take the diſtance of the light, or object, from the inſtrument, which is afterwards removed, and a perſon ſtands on the ſpot where it ſtood, holding one end of the chain in his hand, while another, going towards the object, holds the other end, together with a lighted candle, in the ſame hand, and being directed by the former, till the hand holding the candle

Surveying.

candle and the chain is in a direct line with the object or light whose bearing was taken. At that place, the first chain is marked. The person who stood where the instrument was placed then comes forward to the mark at the end of the first chain, the other advancing forward another chain, with the chain and candle in the same hand, as before directed: here the second chain is to be marked. Proceeding in this manner till the distance of the object be determined, which being noted down in chains and links in the survey book, opposite to the bearing, the first bearing and distance is completed. Fixing the instrument again where the light as an object stood, or at the termination of the foregoing bearing and distance, and taking the second bearing, by directing the person to go forward as before, so far as his light can be seen, or at any convenient distance, the surveyor is to proceed as before, till the whole is completed.

Such surveys would require five people to be employed, that the work may be expeditiously performed; viz. one to carry forward the survey, and make the requisite observations and remarks; another to carry the instruments employed; another to direct the chain; a fourth person to lead it, and a fifth to go forward with a light, as an object, from one station to another. During the time of making the survey, care must be taken not to admit any iron or steel within four feet of the instrument, for fear of attracting the needle, which has been known to be affected at nearly three times that distance, by a massy piece of iron. If the glass of the instrument should require cleaning, it must be rubbed as gently as possible, and not with any silken substance, by means of which electric matter may be excited, and prevent the needle from traversing. Should such matter be excited, it may be discharged by touching the surface of the glass with a wet finger.

To render this system of surveying familiar to the young miner, it would be necessary for him to put up a number of marks on the surface, taking afterwards their bearing and distance from each other, according to the method before directed; but to make a nearer approach to the form of subterraneous surveying, it would be better to perform it at night, by the assistance of candles; and many evenings might be found favourable for this method of practising. Lanterns may be employed, if the current of air should be too strong for the flame of a candle *.

* *Fenwick on Subterraneous Surveying*, p. 9.

The method of *surveying and recording bearings* is as follows,

Suppose the bearing of ABC (fig. 14) is required. Set the circumferentor on A (the north being represented by N, and the south by S); then turning that part of the instrument having the *fleur de lis*, or other device, from you, or towards B, turn the instrument till the object B is seen through, and cut by the hair in the sights; and the angle N A B being the angle that the sights and line A B make with the magnetic meridian, N S will be the bearing of B from A, suppose 30°; which also being to the right side of the north meridian, will be north 30° east. Then bring the instrument forward to B, fixing it there, and directing the same sight at B towards C, as was directed at A, towards B; then observe the angle that B C makes with the magnetic meridian, which suppose 25° N B C; and being to the left of the meridian, will be north 25° west. To prove the work, and try the accuracy of the instrument when it is standing at B, apply the eye to that sight which was next B when it stood at A; then take the bearing of A from B, which, if found to be the reverse of B from A, shows the work to be so far true. The bearing of B being taken in like manner from C, will prove the truth of the survey. The degrees of each bearing must always be taken by the same end of the needle.

Suppose the bearing of B from A, C from B, and D from C, (fig. 15.) be required. Fix the instrument at A, with the *fleur de lis*, or other arbitrary device, towards B; then take the bearing of B, as before described, which suppose to make an angle of 30° NAB to the right with the magnetic meridian, or north 30° east; let the instrument be removed to B, and take the bearing of C, which suppose =30° NBC to the left, or north 30° west; then remove the instrument to C, and take the bearing of D, which suppose =65° SCD to the left, or south 65° east: Thus,

From A to B north 30° east.
—— B to C north 30° west.
—— C to D south 65° east.

This survey may be proved in the same manner as the preceding.

Suppose the subterraneous working ABCDA (fig. 16.) to be surveyed, beginning at the pit A: Fix the instrument at the centre of the pit A; then let a person hold a lighted candle at B (being the utmost distance at which it can be seen through the sights of the instrument), the bearing of which being taken from A, suppose due south, or in the direction of the magnetic meridian of A, and its distance from A suppose 6 chains 57 links, which is placed in the survey book as under: Remove the instrument to B, where the candle stood, and direct the person to place the lighted candle at C; then take its bearing from B, which suppose it to make an angle CBS = 80° with the magnetic meridian, or to bear south 80° west, and its distance being found 7 chains 10 links, remove the instrument to C, the candle being removed to D; then take its bearing and distance as before, which suppose north 10° west 5 chains; remove the instrument to D, and direct the candle to be placed at the centre of the pit A, where the survey commenced; then take its bearing from D, north 70° east 8 chains 35 links, and the survey is finished.

	Chains.	Links.
AB south	6	57
BC south 80 west	7	10
CD north 10° west	5	0
DA north 70° east	8	35

This survey may be proved by adding together the degrees contained in the interior angles, which, if they amount to 360, the work will be right.

The proof may be made by finding the northing, southing, easting and westing of all the bearings and distances. If the southings are equal to the northings, and the westings equal to the eastings, then will the work be right.

Thus,

	C.	L.	Northings. C.	L.	Southings. C.	L.	Eastings. C.	L.	Westings. C.	L.
Thus, S.	6	57	0	0	6	57	0	0	0	0
S. 80° W	7	10	0	0	1	23	0	0	6	98
N. 10° W	6	0	4	93	0	0	0	0	0	87
N. 70° E.	8	35	2	87	0	0	7	85	0	0
			7	80	7	80	7	85	7	85

The southings and northings therefore being equal, as also the eastings and westings, the work is thus proved to be right *.

* *Ib.* p. 29.

Mr Fenwick gives the following directions for planning subterraneous surveys, and for determining errors that may arise in plotting, through inattention to the magnetic variation.

As the magnetic meridian is always changing, the bearings of the same object, taken by such a meridian at different times, must also vary from each other, except reduced to bearings with the true meridian. Let NS (fig. 17.) represent the meridian of a plan, which is also supposed to be the true meridian; and if a subterraneous excavation is to be plotted on it from the pit A, and this excavation is found to form a bearing of north 10° west 10 chains, by an instrument whose needle had 20° of west variation; now if the excavation north 10° west 10 chains be plotted on the plan by its meridian NS, which is the true meridian, it will be represented by AB; but the bearing being taken by a needle having 20° of west variation, it should form a bearing of north 30° west with the meridian NI, as represented by A *b*; then A *b* will be the true direction of the excavation from the pit A, and *b* B will be the magnitude of the error. Or, instead of reducing the excavation to its bearing with the true meridian NI, it will be equally as true if *n s* is drawn on the plan, and made to represent the magnetic meridian of the needle by which the bearing was taken, with which AB will form a bearing of north 10° west.

We shall add a few examples illustrative of the error arising from plotting a subterraneous survey on a plan, without attending to the variation of the magnetic meridian, and also how its magnitude can be ascertained.

Example I.—The following is a subterraneous survey, commencing at a pit called the B pit, north 30°, west 6 chains, north 70°, east 10 chains, north 30°, east 5 chains, and north 25°, west 8 chains, which was surveyed by an instrument whose needle had 24° of west variation; under what bearings must the survey be plotted on a plan whose delineated meridian has 15° of west variation?

Reduce the bearings, as taken by a meridian having 24° of west variation, to bearings with a meridian having 14° of west variation: thus,

Bearings with a meridian of 24° of west variation.	Chains.	*Bearings with a meridian of 15° of west variation.*	Chains.
North 30° west	6	North 39° west	6
North 70° east	10	North 61° east	10
North 30° east	5	North 21° east	5
North 25° west	8	North 34° west	8

The survey must be plotted under bearings with a magnetic meridian having 15° of west variation, as above, commencing at the B pit.

Example II.—If the following subterraneous survey, north 9° west 8 chains, north 30° east 7 chains, and north 21° west 8 chains be made by an instrument whose needle has 23° of west variation, and plotted on a plan by a meridian having 5° of magnetic variation, without being reduced thereto; what will be the magnitude of the error resulting from such neglect?

Suppose A (fig. 18.) the point of commencement of the survey on the plan, and let the meridian of the plan be represented by N *s*, having 5° of west variation with the true meridian NS; then the first bearing, north 9° west 8 chains, will be represented by AB; the second, north 30° east 7 chains, by BC; and the third bearing, north 21° west 8 chains, by CD; then ABCD will represent the survey plotted, without attending to the magnetic variation: But as the survey was made by an instrument whose needle had 23° of west variation, therefore each bearing, when truly plotted, must be set off from a meridian of that variation, which, let *n s* represent; then, north 9° west 8 chains will be represented by A *b*, north 30° east 7 chains by *b c*, and north 21° west 8 chains by *c d*; then A *b c d* will represent the survey truly plotted, and *d* D will be the magnitude of the error.

Or the survey may be plotted by reducing the bearings, as taken by a meridian of 23° of west variation, to bearings with a meridian of 5° of variation, as represented by N *s*, and plotted from it accordingly; which will exactly coincide with A *b c d*, as before.

To discover, by calculation, the magnitude of the error, reduce the bearings of the survey, as taken by a magnetic meridian having 23° of west variation, to bearings with the true meridian; and also the same bearings, as if taken by a meridian having 5° of west variation, to bearings with the true meridian; then determine the northing and easting of D from *d*: thus,

With a meridian of 23° of west variation.	Chains.	*With the true meridian.*	C
N. 9° W.	8	N. 32° W.	8
N. 30° E.	7	N. 7° E.	7
N. 21° W.	8	N. 44° W.	8

With a meridian of 5° west variation.	C.	*With the true meridian.*	C.
N. 9° W.	8	N. 14° W.	8
N. 30° E.	7	N. 25° E.	7
N. 21° W.	8	N. 26° W	8

Surveying.

Surveying || Survivorship.

	C.	Northing. C.	L.	Southing. C.	L.	Easting. C.	L.	Westing. C.	L.
N. 32° W.	8	6	78					4	23
N. 7° E.	7	6	94			0	85		
N. 44° W.	8	5	75					5	55
				A *a*					
		19	47					9	78
								0	85
								8	93 *a d.*

	C.	C.	L.	C.	L.	C.	L.	C.	L.
N. 14° W.	8	7	76					1	93
N. 25° E.	7	6	34			2	95		
N. 26° W.	8	7	19					3	50
				A *e*					
		21	29					5	43
								2	95
								2	48 *e* D or *a f.*

a d 8 chains 93 links—*a f* 2 chains 48 links=*f d* 6 chains 45 links.
A *e* 21 chains 29 links—A *a* 19 chains 47 links=*a e* or *f* D 1 chain 82 links.

Then, as *f d* 6.45	.8095595
Is to radius	10.0000000
So is *f* D 1.82	.2600714
To tang. ∠ *d* 15° 45′	9.4505117
From 90°—15° 45′=74° 15′, ∠ N *d* D.	
—2 —2	

And $\sqrt{6.45+1.82}$=6.7 *d* D, or 6 chains 70 links.

Ib. p. 155. Therefore, the amount of the error, or the bearing and diſtance of D from *d*, will be north, 74° 15′ eaſt 6 chains 70 links with the true meridian.

SURVEYOR, a perſon who has the overſight and care of conſiderable works, lands, or the like.

SURVEYOR, likewiſe denotes a gauger; as alſo a perſon who ſurveys lands, and makes maps of them.

SURVIVOR, in *Law*, ſignifies the longeſt liver of joint tenants, or of any two perſons jointly intereſted in a thing.

SURVIVORSHIP, is that branch of mathematics which treats of reverſions payable provided one or more particular perſons ſurvive certain others. By reverſions are meant payments not to take place till ſome future period. Survivorſhip forms one of the moſt difficult and complicated parts of the doctrine of reverſions and life-annuities. It has been very fully treated of by Mr Thomas Simpſon in his Select Exerciſes, and conſiderably improved by Dr Price and Mr Morgan, who have beſtowed a great deal of attention on this ſubject; though ſome parts of their principles are erroneous.

The calculations are founded on the expectation of lives at different ages, deduced from tables formed from bills of mortality, of which ſee ſeveral examples under the article *Bills of* MORTALITY. By the expectation of life is meant the mean time that any ſingle or joint lives at a given age is found to continue; that is, the number of years which, taking one with another, they actually enjoy, and may be conſidered as ſure of enjoying; thoſe who ſurvive that period enjoying as much more time in proportion to their number as thoſe who fall ſhort of it enjoy leſs. Thus, ſuppoſing 46 perſons alive all 40 years of age, and that one will die every year till they are all dead in 46 years, half 46 or 23 will be the *expectation* of each of them. If M. de Moivre's hypotheſis were true, that men always decreaſe in an arithmetical progreſſion, the expectation of a ſingle life is always half its complement (A), and the expectation of two joint lives one-third of their common complement. Thus, ſuppoſing a man 40, his expectation would be 23, the half of 46, his complement; the expectation of two joint lives, each 40, would be 15 years 4 months, or the third part of 46.

The number expreſſing the expectation, multiplied by the number of ſingle or joint lives (of which it is the expectation), added annually to a ſociety, gives the whole number living together, to which ſuch an annual addition would in time grow. Thus, ſince 19, or the third of 57, is the expectation of two joint lives, whoſe common age is 29, twenty marriages every year between perſons of this age would in 57 years grow to 20 times 19,

(A) By the complement of a life is meant what it wants of 86, which M. de Moivre makes the boundary of human life. Thus if a man be 30, the complement of his life is 56.

Survivorship.

19, or 380 marriages, always exiſting together. And ſince the expectation of a ſingle life is always half its complement, in 57 years 20 ſingle perſons added annually to a town will increaſe to 20 times 28.5, or 570; and when arrived at this number, the deaths every year will juſt equal the acceſſions, and no farther increaſe be poſſible. It appears from hence, that the particular proportion that becomes extinct every year, out of the whole number conſtantly exiſting together of ſingle or joint lives, muſt, wherever this number undergoes no variation, be exactly the ſame with the expectation of thoſe lives, at the time when their exiſtence commenced. Thus, was it found that a 19th part of all the marriages among any bodies of men, whoſe numbers do not vary, are diſſolved every year by the deaths of either the huſband or wife, it would appear that 19 was, at the time they were contracted, the expectation of theſe marriages. In like manner, was it found in a ſociety, limited to a fixed number of members, that a 28th part dies annually out of the whole number of members, it would appear that 28 was their common expectation of life at the time they entered. So likewiſe, were it found in any town or diſtrict, where the number of births and burials are equal, that a 20th or 30th part of the inhabitants die annually, it would appear that 20 or 30 was the expectation of a child juſt born in that town or diſtrict. Theſe expectations, therefore, for all ſingle lives, are eaſily found by a table of obſervations, ſhowing the number that die annually at all ages out of a given number alive at thoſe ages; and the general rule for this purpoſe is, to divide the ſum of all the living in the table, at the age whoſe expectation is required, and at all greater ages, by the ſum of all that die annually at that age and above it; or, which is the ſame, by the number (in the Table) of the living at that age; and half unity ſubtracted from the quotient will be the required expectation. Thus, in Dr Halley's table, given in the article ANNUITY, the ſum of all the living at 20 and upwards is 20,724, which, divided by 598, the number living at the age of 20, and half unity ſubtracted from the quotient, gives 34.15 for the expectation of 20.

In calculating the value or expectation of joint lives, M. de Moivre had recourſe to the hypotheſis, that the probabilities of life decreaſe in a geometrical progreſſion; believing that the values of joint lives, obtained by rules derived from it, would not deviate much from the truth. But in this he was greatly miſtaken; they generally give reſults which are near a quarter of the true value too great in finding the preſent value of one life after it has ſurvived another in a ſingle payment, and about two-fifths too great when the value is ſought in annual payments during the joint lives. They ought therefore to be calculated on the hypotheſis (if they are calculated on hypotheſis at all), that the probabilities of life decreaſe in arithmetical progreſſion, which is not very far from the truth. Even this hypotheſis never correſponds with the fact in the firſt and laſt periods of life, and in ſome ſituations not in any period of life. Dr Price and Mr Morgan therefore have given tables of the value of lives, not founded on any hypotheſis, but deduced from bills of mortality themſelves. Some of theſe we ſhall give at the end of this article. Mr Morgan has likewiſe given rules for calculating values of lives in this manner.

M. de Moivre has alſo fallen into miſtakes in his rules for calculating the value of reverſions depending on ſurvivorſhip: theſe have been pointed out by Dr Price in the third eſſay in the firſt volume of his Treatiſe on Reverſionary Payments; who has alſo given proper rules for calculating theſe values, the moſt important of which are comprehended in the following paragraphs.

Survivorſhip.

1 Method of finding the number of annuitants that will come on a ſociety.

Suppoſe a ſet of married men to enter into a ſociety in order to provide annuities for their widows, and that it is limited to a certain number of members, and conſtantly kept up to that number by the admiſſion of new members as the old ones are loſt; it is of importance, in the firſt place, to know the number of annuitants that after ſome time will come upon the eſtabliſhment. Now ſince every marriage produces either a widow or widower; and ſince all marriages taken together would produce as many widows as widowers, were every man and his wife of the ſame age, and the chance equal which ſhall die firſt; it is evident, that the number of widows that have ever exiſted in the world, would in this caſe be equal to half the number of marriages. And what would take place in the world muſt alſo, on the ſame ſuppoſitions, take place in this ſociety. In other words, every other perſon in ſuch a ſociety leaving a widow, there muſt ariſe from it a number of widows equal to half its own number. But this does not determine what number, all living at one and the ſame time, the ſociety may expect will come to be conſtantly on it. It is, therefore, neceſſary to determine how long the duration of ſurvivorſhip between perſons of equal ages will be, compared with the duration of marriage. And the truth is, that, ſuppoſing the probabilities of life to decreaſe uniformly, the former is equal to the latter; and conſequently that the number of ſurvivors, or (which is the ſame, ſuppoſing no ſecond marriages) of widows and widowers alive together, which will ariſe from any given ſet of ſuch marriages conſtantly kept up, will be equal to the whole number of marriages; or half of them (the number of widows in particular) equal to half the number of marriages. Now it appears that in moſt towns the decreaſe in the probabilities of life is in fact nearly uniform. According to the Breſlaw Table of Obſervations (ſee ANNUITY), almoſt the ſame numbers die every year from 20 years of age to 77. After this, indeed, fewer die, and the rate of decreaſe in the probabilities of life is retarded. But this deviation from the hypotheſis is inconſiderable; and its effect, in the preſent caſe, is to render the duration of ſurvivorſhip longer than it would otherwiſe be. According to the London Table of Obſervations, the numbers dying every year begin to grow leſs at 50 years of age; and from hence to extreme old age there is a conſtant retardation in the decreaſe of the probabilities of life. Upon the whole, therefore, it appears that, according to the Breſlaw Table, and ſuppoſing no widows to marry, the number inquired after is ſomewhat greater than half the number of the ſociety; but, according to the London Table, a good deal greater. This, however, has been determined on the ſuppoſition that the huſbands and wives are of equal ages, and that then there is an equal chance who ſhall die firſt. But in reality huſbands are generally older than wives, and males have been found to die ſooner than females, as appears inconteſtably from ſeveral of the tables in Dr Price's Treatiſe on Reverſions. It is therefore more than an equal chance that the huſband will die before his wife. This will increaſe conſiderably the duration of

Survivorship.

of survivorship on the part of the women, and consequently the number which we have been inquiring after. The marriage of widows will diminish this number, but not so much as the other causes will increase it.

2 When the number of annuitants arrives at its maximum.

If the society comprehends in it from the first all the married people of all ages in any town, or among any class of people where the numbers always continue the same, the whole collective body of members will be at their greatest age at the time of the establishment of the society; and the number of widows left every year will at a medium be always the same. The number of widows will increase continually on the society, till as many die every year as are added. This will not be till the whole collective body of widows are at their greatest age, or till there are among them the greatest possible number of the oldest widows; and therefore not till there has been time for an accession to the oldest widows from the youngest part.

Let us, for the sake of greater precision, divide the whole medium of widows that come on every year into different classes according to their different ages, and suppose some to be left at 56 years of age, some at 46, some at 36, and some at 26. The widows, constantly in life together, derived from the first class, will come to their greatest age, and to a *maximum*, in 30 years, supposing, with M. de Moivre, 86 to be the utmost extent of life. The same will happen to the second class in 40 years, and to the third in 50 years. But the whole body composed of these classes will not come to a *maximum* till the same happens to the fourth or youngest class; that is, not till the end of 60 years. After this the affairs of the society will become stationary, and the number of annuitants on it of all ages will keep always nearly the same.

If a society begins with its complete number of members, but at the same time admits none above a particular age: If, for instance, it begins with 200 members all under 50, and afterwards limits itself to this number, and keeps it up by admitting every year, at all ages between 26 and 50, new members as old ones drop off; in this case, the period necessary for bringing on the *maximum* of annuitants will be just doubled.

3 What a man ought to pay in a single payment to entitle his widow to a certain annuity.

To determine the sum that every individual ought to pay in a single present payment, in order to intitle his widow to a certain annuity for her life, let us suppose the annuity 3l. per annum, and the rate of interest four per cent. It is evident, that the value of such an expectation is different, according to the different ages of the purchasers, and the proportion of the age of the wife to that of the husband. Let us then suppose that every person in such a society is of the same age with his wife, and that one with another all the members when they enter may be reckoned 40 years of age, as many entering above this age as below it. It has been demonstrated by M. de Moivre and Mr Simpson, that the value of an annuity on the joint continuance of any two lives, subtracted from the value of an annuity on the life in expectation, gives the true present value of annuity on what may happen to remain of the latter of the two lives after the other.

In the present case, the value of an annuity to be enjoyed during the joint continuance of two lives, each 40, is, by Table II. 9.826, according to the probabilities of life in the Table of Observations formed by Dr Halley from the bills of mortality of Breslaw in Silesia. The value of a single life 40 years of age, as given by M. de Moivre, agreeably to the same table, is 13.20; and the former subtracted from the latter, leaves 3.37, or the true number of years purchase, which ought to be paid for any given annuity, to be enjoyed by a person 40 years of age, provided he survives another person of the same age, interest being reckoned at four per cent. per annum. The annuity, therefore, being 30l. the present value of it is 30 multiplied by 3.37, or 101l. 2s.

Survivorship.

4 What he ought to pay in annual payments.

If, instead of a single present payment, it is thought preferable to make annual payments during the marriage; what these annual payments ought to be is easily determined by finding what annual payments during two joint lives of given ages are equivalent to the value of the reversionary annuity in present money. Suppose, as before, that the joint lives are each 40, and the reversionary annuity 30l. per annum. An annual payment during the continuance of two such lives is worth (according to Table II.) 9.82 years purchase. The annual payment ought to be such as, being multiplied by 9.82, will produce 101.1l. the present value of the annuity in one payment. Divide then 101.1 by 9.82, and 10.3 the quotient will be the annual payment. This method of calculation supposes that the first annual payment is not to be made till the end of a year. If it is to be made immediately, the value of the joint lives will be increased one year's purchase; and therefore, in order to find the annual payments required, the value of a present single payment must be divided by the value of the joint lives increased by unity. If the society prefer paying part of the value in a present single payment on admission, and the rest in annual payments; and if they fix these annual payments at a particular sum, the present single payment paid on admission is found by subtracting the value of the annual payment during the joint lives from the whole present value of the annuity in one payment. Suppose, for instance, the annual payments to be fixed at five guineas, the annuity to be 30l. the rate of interest four per cent. and the joint lives each 40; the value of the annuity in one present single payment is 101.1l. The value of five guineas or 5.25 per annum, is (5.25 multiplied by 9.82 the value of the joint lives) 51.55; which, subtracted from 101.1l. gives 49.5l. the answer.

If a society takes in all the marriages among persons of a particular profession within a given district, and subjects them for perpetuity to a certain equal and common tax or annual payment, in order to provide life annuities for all the widows that shall result from these marriages; since, at the commencement of such an establishment, all the oldest, as well as the youngest, marriages are to be intitled equally to the proposed benefit, a much greater number of annuitants will come immediately on it than would come on any similar establishment which limited itself in the admission of members to persons not exceeding a given age. This will check that accumulation of money which should take place at first, in order to produce an income equal to the disbursements at the time when the number of annuitants comes to a *maximum*; and therefore will be a particular burden upon the establishment in its infancy. For this some compensation must be provided; and the equitable method of providing it is, by levying fines at the beginning of the establishment on every member exceeding

Survivorship.

ceeding a given age, proportioned to the number of years which he has lived beyond that age. But if such fines cannot be levied, and if every payment must be be equal and common, whatever disparity there may be in the value of the expectations of different members, the fines must be reduced to one common one, answering as nearly as possible to the disadvantage, and payable by every member at the time when the establishment begins. After this, the establishment will be the same with one that takes upon it all at the time they marry; and the tax or annual payment of every member adequate to its support will be the annual payment during marriage due from persons who marry at the mean age at which, upon an average, all marriages may be considered as commencing. The fines to be paid at first are, for every particular member, the same with the difference between the value of the expectation to him at his present age, and what would have been its value to him had the scheme begun at the time he married. Or, they are, for the whole body of members, the difference between the value of the common expectation, to persons at the mean age of all married persons taken together as they exist in the world, and to persons at that age which is to be deemed their mean age when they marry.

5 Method of finding the present value of an annuity to be enjoyed by one life after the expiration of another.

Suppose we wish to know the present value of an annuity to be enjoyed by one life, for what may happen to remain of it beyond another life, after a given term; that is, provided both lives continue from the present time to the end of a given term of years; the method of calculating is this: Find the value of the annuity for two lives, greater by the given term of years than the given lives; discount this value for the given term; and then multiply by the probability, that the two given lives shall both continue the given term; and the product will be the answer. Thus, let the two lives be each 30, the term seven years, the annuity 10l. interest four per cent. The given lives, increased by seven years, become each 37. The value of two joint lives, each 37, is (by Table II.) 10.25. The value of a single life at 37 is (by the table under the article ANNUITY) 13.67. The former subtracted from the latter is 3.42, or the value of an annuity for the life of a person 37 years of age, after another of the same age, as has been shown above. 3.42 discounted for seven years (that is, multiplied by 0.76 the value of 1l. due at the end of seven years) is 2.6. The probability that a single life at 30 shall continue seven years is $\frac{49}{56}$ (B). The probability, therefore, that two such lives shall continue seven years, is $\frac{2401}{3136}$, or in decimals 0.765; and 2.6 multiplied by 0.765 is 1.989, the number of years purchase which ought to be given for an annuity to be enjoyed by a life now 30 years of age, after a life of the same age, provided both continue seven years. The annuity then being 10l. its present value is 19.89l.

Survivorship.

6 Method of finding the value of an annuity for what may happen to remain of one life after another, provided the life in expectation continues a given term.

Suppose the value is required of an annuity to be enjoyed for what may happen to remain of one life after another, provided the life in expectation continues a given time. 1. Find the present value of the annuity for the remainder of the life in expectation after the given time, which is done in this manner: Multiply the present value of the life at the given time by the present value of 1l. to be received at that time, and multiply the product again by the probability that the life in expectation will continue so long. Let the given time which the life in expectation is to continue be 15 years, and let the person then be arrived at 50 years of age. A life at fifty, according to M. de Moivre's valuation of lives, and reckoning interest at four per cent. is worth 11.34 years purchase. The present value of 1l. to be received at the end of 15 years, is 0.5553, and the probability that a life at 35 will continue 15 years is $\frac{146}{495}$. These three values multiplied into one another give 4.44l. for the present value of the life in expectation. 2. Find the value of the reversion, provided both lives continue the given time, by the rule given in parag. 5th. 3. Add these values together, and the sum will be the answer in a single present payment. We shall now illustrate this rule by an example.

An annuity of 10l. for the life of a person now 30, is to commence at the end of 11 years, if another person now 40 should be then dead; or, if this should not happen at the end of any year beyond 11 years in which the former shall happen to survive the latter: What is the present value of such an annuity, reckoning interest at four per cent. and taking the probabilities of life as they are in Dr Halley's table, given in the article MORTALITY?

The value of 10l. per annum, for the remainder of the life of a person now 30, after 11 years is 69.43l. The probability that a person 40 years of age shall live 11 years, is, by Dr Halley's table $\frac{335}{445}$. The probability, therefore, that he will die in 11 years, is $\frac{335}{445}$ subtracted from unity (C), or $\frac{110}{445}$; which multiplied by 69.43l. gives 17.16l.—The value of the reversion, provided both live 11 years, is 17l. and this value added to the former, makes 34.16l. the value required in a single present payment; which payment divided by 11.43l. the value of two joint lives, aged 30 and 40, with unity added, gives 3l.; or the value required in annual payments during the joint lives, the first payment to be made immediately.

TABLE

(B) The probability that a given life shall continue any number of years, or reach a given age, is (as is well known) the fraction, whose numerator is the number of the living in any table of observations opposite to the given age, and denominator, the number opposite to the present age of the given life.

(C) For the difference between unity and the fraction expressing the probability that an event will happen, gives the probability that it will not happen.

TABLE

Survivorship.

TABLE I. *Showing the Present Values of an Annuity of* 1 l. *on a Sirgle Life, according to M. de Moivre's Hypothesis.*

Age.	3 per ct.	3½ per ct	4 per ct.	4½ per ct	5 per ct.	6 per ct.
8	19.736	18.160	16.791	15.595	14.544	12.790
9	19.868	18.269	16.882	15 672	14.607	12.839
10	19.868	18.269	16.882	15.672	14.607	12.839
11	19 736	18.160	16.791	15.595	14.544	12.790
12	19.604	18.049	16.698	15.517	14.480	12.741
13	19.469	17.937	16.604	15.437	14.412	12.691
14	19.331	17.823	16.508	15.356	14.342	12.639
15	19.192	17.707	16.410	15.273	14.271	12.586
16	19.050	17.588	16.311	15.189	14.197	12.532
17	18.905	17.467	16.209	15.102	14.123	12.476
18	18.759	17.344	16.105	15.015	14.047	12.419
19	18.610	17.220	15.999	14.923	13.970	12.361
20	18.458	17.093	15.891	14.831	13.891	12.301
21	18.305	16.963	15.781	14.737	13.810	12.239
22	18.148	16.830	15.669	14.641	13.727	12.177
23	17.990	16.696	15.554	14.543	13.642	12.112
24	17.827	16.559	15.437	14.442	13.555	12.045
25	17.664	16.419	15.318	14.340	13.466	11.978
26	17.497	16.277	15.197	14.235	13.375	11.908
27	17.327	16.133	15.073	14.128	13.282	11.837
28	17.154	15.985	14.946	14.018	13.186	11.763
29	16.979	15.835	14.816	13.905	13.088	11.688
30	16.800	15.682	14.684	13.791	12 988	11.610
31	16.620	15.526	14.549	13.673	12.855	11.530
32	16 436	15.367	14.411	13.553	12.780	11.449
33	16.248	15.204	14.270	13.430	12.673	11.365
34	16.057	15.039	14.126	13.304	12.562	11.278
35	15.864	14.871	13.979	13.175	12.449	11.189
36	15.666	14.699	13.829	13.044	12.333	11.098
37	15.465	14.524	13.676	12.909	12.214	11.003
38	15.260	14.345	13.519	12.771	12.091	10.907
39	15.053	14.163	13.359	12.630	11.966	10.807
40	15.842	13.978	13.196	12.485	11.837	10.704
41	14.626	13.789	13.028	12.337	11.705	10.599
42	14.407	13.596	12.858	12.185	11.570	10.490
43	14.185	13.399	12.683	12.029	11.431	10.378
44	13.958	13.199	12.504	11.870	11.288	10.263
45	13.728	12.993	12.322	11.707	11.142	10.144
46	13.493	12.784	12.135	11.540	10.992	10.021
47	13.254	12.571	11.944	11.368	10.837	9.895
48	13.012	12.354	11.748	11.192	10.679	9.765
49	12.764	12.131	11.548	11.012	10.515	9.630
50	12.511	11 904	11.344	10.827	10.348	9.492
51	12.255	11.673	11.135	10.638	10.176	9 349
52	11 994	11.437	10.921	10.443	9.999	9.201
53	11.729	11.195	10.702	10.243	9.817	9.049
54	11.457	10.950	10.478	10.039	9.630	8.891
55	11.183	10.698	10.248	9.829	9.437	8.729
56	10.902	10.443	10.014	9.614	9.239	8.561
57	10.616	10.181	9.773	9.393	9.036	8.387
58	10.323	9.913	9.527	9.166	8.826	8.208
59	10 029	9.640	9.275	8.933	8.611	8.023
60	9.727	9.361	9.017	8.694	8.389	7.831
61	9.419	9.076	8.753	8.449	8.161	7.633
62	9.107	8.786	8.482	8.197	7.926	7.428
63	8.787	8.488	8.205	7.938	7.684	7.216
64	8.462	8.185	7.921	7.672	7.435	6.997
65	8.132	7.875	7.631	7.399	7.179	6.770
66	7.794	7.558	7.333	7.119	6.915	6.535
67	7.450	7.234	7.027	6.831	6.643	6.292
68	7.099	6.902	6.714	6.534	6.362	6.040
69	6.743	6.565	6.394	6.230	6.073	5.779
70	6.378	6.219	6.065	5.918	5.775	5.508
71	6.008	5.865	5.728	5.596	5.468	5.228
72	5.631	5.505	5.383	5.265	5.152	4.937
73	5.246	5.136	5.029	4.926	4.826	4.636
74	4.854	4.759	4.666	4.576	4.489	4.324
75	4.453	4.373	4.293	4.217	4.143	4.000
76	4.046	3.978	3.912	3.847	3.784	3.664
77	3.632	3.575	3.520	3.467	3.415	3.315
78	3.207	3.163	3.111	3.076	3.034	2.953
79	2.776	2.741	2.707	2.673	2.641	2.578
80	2.334	2.309	2.284	2.259	2.235	2.188
81	1.886	1.867	1.850	1.832	1.816	1.783
82	1.429	1.411	1.406	1.394	1.384	1.362
83	0.961	0.955	0.950	0.943	0.937	0.925
84	0.484	0.483	0.481	0.479	0.479	0.472
85	0.000	0.000	0.000	0.000	0.000	0.000

TABLE II. *Showing the Value of an Annuity on the Joint Continuance of Two Lives, according to M. de Moivre's Hypothesis.*

Age of the Youngest.	Age of the Eldest.	Value at 5 per cent.	Value at 3 per cent.	Value at 4 per cent.
10	10	15.206	13.342	11.855
	15	14.878	13.093	11.661
	20	14.503	12.808	11.430
	25	14.074	12.480	11.182
	30	13.585	12.102	10.884
	35	13.025	11.665	10.537
	40	12.381	11.156	10.128
	45	11.644	10.564	9.646
	50	10.796	9.871	9.074
	55	9.822	9.059	8.391
	60	8.704	8.105	7.572
	65	7.417	6.980	6.585
	70	5.936	5.652	5.391
15	15	14.574	12.860	11.478
	20	14.225	12.593	11.266
	25	13.822	12.281	11.022
	30	13.359	11.921	10.736
	35	12.824	11.501	10.402
	40	12.207	11.013	10.008
	45	11.496	10.440	9.541
	50	10.675	9.767	8.985
	55	9.727	8.975	8.318
	60	8.632	8.041	7.515
	65	7.377	6.934	6.544
	70	5.932	5.623	5.364
20	20	13.904	12.341	11.067
	25	13.531	12.051	10.840
	30	13.098	11.711	10.565
	35	12.594	11.314	10.278
	40	12.008	10.847	9.870
	45	11.325	10.297	9 420
	50	10.536	9.648	8.880

Age

Survivorship.

Age of the Youngest.	Age of the Eldest.	Value at 3 per cent.	Value at 4 per cent.	Value at 5 per cent.
	55	9.617	8.879	8.233
	60	8.549	7.967	7.448
	65	7.308	6.882	6.495
	70	5.868	5.590	5.333
25	25	13.192	11.786	10.621
	30	12.794	11.468	10.367
	35	12.333	11.093	10.067
	40	11.770	10.655	9.708
	45	11.130	10.131	9.278
	50	10.374	9.509	8.761
	55	9.488	8.766	8.134
	60	8.452	7.880	7.371
	65	7.241	6.826	6.440
	70	5.826	5.551	5.294
30	30	12.434	11.182	10.133
	35	12.010	10.838	9.854
	40	11.502	10.428	9.514
	45	10.898	9.936	9.112
	50	10.183	9.345	8.620
	55	9.338	8.634	8.018
	60	8.338	7.779	7.280
	65	7.161	6.748	6.373
	70	5.777	5.505	5.254
35	35	11.632	10.530	9.600
	40	11.175	10.157	9.291
	45	10.622	9.702	8.913
	50	9.955	9.149	8.450
	55	9.156	8.476	7.879
	60	8.202	7.658	7.172
	65	7.066	6.662	6.294
	70	5.718	5.450	5.203
40	40	10.777	9.826	9.014
	45	10.283	9.418	8.671
	50	9.677	8.911	8.244
	55	8.936	8.283	7.710
	60	8.038	7.510	7.039
	65	6.951	6.556	6.198
	70	5.646	5.383	5.141
45	45	9.863	9.063	8.370
	50	9.331	8.619	7.987
	55	8.662	8.044	7.500
	60	7.831	7.332	6.875
	65	6.807	6.435	6.080
	70	5.556	5.300	5.063
50	50	8.892	8.235	7.660
	55	8.312	7.738	7.230
	60	7.568	7.091	6.664
	65	6.623	6.258	5.926
	70	5.442	5.193	4.964
55	55	7.849	7.332	6.873
	60	7.220	6.781	6.386
	65	6.379	6.036	5.724
	70	5.201	5.053	4.833
60	60	6.737	6.351	6.001
	65	6.043	5.730	5.444
	70	5.081	4.858	4.653
65	65	5.547	5.277	5.031
	70	4.773	4.571	4.385
70	70	4.270	4.104	3.952

Survivorship.

TABLE III. *Showing the Values of Annuities on Single Lives, among Males and Females, according to the Probabilities of the Duration of Life in the Kingdom of Sweden.*

	Males.		Females.		Lives in general.	
Ages.	4 per ct.	5 per ct.	4 per ct.	5 per ct.	4 per ct.	5 per ct
1	16.503	14.051	16.820	14.271	16.661	14.161
2	17.355	14.778	17.719	15.034	17.537	14.906
3	17.935	15.279	18.344	15.571	18.139	15.425
4	18.328	15.624	18.780	15.951	18.554	15.787
5	18.503	15.786	18.927	16.088	18.715	15.937
6	18.622	15.901	19.045	16.203	18.833	16.052
7	18.693	15.977	19.131	16.291	18.912	16.134
8	18.725	16.021	19.162	16.335	18.943	16.178
9	18.715	16.030	19.151	16.343	18.933	16.186
10	18.674	16.014	19.109	16.325	18.891	16.169
11	18.600	15.970	19.041	16.286	18.820	16.128
12	18.491	15.896	18.952	16.229	18.721	16.062
13	18.378	15.819	18.840	16.153	18.609	15.986
14	18.246	15.724	18.707	16.059	18.476	15.891
15	18.105	15.624	18.568	15.960	18.336	15.792
16	17.958	15.517	18.424	15.856	18.191	15.686
17	17.803	15.404	18.290	15.761	18.046	15.582
18	17.643	15.285	18.151	15.662	17.897	15.473
19	17.492	15.175	18.013	15.563	17.752	15.369
20	17.335	15.059	17.872	15.462	17.603	15.260
21	17.192	14.955	17.725	15.356	17.458	15.155
22	17.042	14.846	17.573	15.245	17.307	15.045
23	16.887	14.732	17.414	15.129	17.150	14.930
24	16.742	14.627	17.252	15.009	16.997	14.818
25	16.592	14.517	17.087	14.886	16.839	14.701
26	16.436	14.402	16.915	14.757	16.675	14.579
27	16.274	14.282	16.751	14.636	16.512	14.459
28	16.105	14.156	16.588	14.515	16.346	14.335
29	15.930	14.024	16.427	14.396	16.178	14.210
30	15.751	13.889	16.261	14.272	16.006	14.080
31	15.575	13.756	16.104	14.156	15.839	13.956
32	15.395	13.619	15.941	14.035	15.668	13.827
33	15.208	13.477	15.787	13.923	15.497	13.700
34	15.014	13.327	15.629	13.806	15.321	13.566
35	14.812	13.170	15.465	13.684	15.138	13.427
36	14.601	13.006	15.278	13.542	14.939	13.274
37	14.382	12.833	15.070	13.382	14.726	13.107
38	14.154	12.652	14.854	13.213	14.504	12.932
39	13.916	12.462	14.629	13.036	14.272	12.749
40	13.668	12.261	14.401	12.856	14.034	12.558
41	13.426	12.065	14.185	12.687	13.805	12.376
42	13.196	11.880	13.994	12.538	13.595	12.209
43	12.984	11.710	13.798	12.387	13.391	12.048
44	12.763	11.532	13.596	12.229	13.179	11.880
45	12.535	11.347	13.383	12.061	12.959	11.704
46	12.297	11.153	13.151	11.876	12.724	11.514
47	12.051	10.951	12.894	11.668	12.472	11.309
48	11.795	10.738	12.620	11.443	12.217	11.090
49	11.528	10.516	12.333	11.205	11.930	10.860
50	11.267	10.298	12.049	10.970	11.658	10.634
51	11.030	10.100	11.769	10.737	11.399	10.418
52	10.785	9.895	11.492	10.507	11.138	10.201
53	10.531	9.682	11.220	10.280	10.875	9.981
54	10.269	9.460	10.937	10.042	10.603	9.751
55	9.998	9.229	10.642	9.792	10.320	9.510

Survivor-ship.

Ages.	Males. 4 per ct.	Males. 5 per ct.	Females. 4 per ct.	Females. 5 per ct.	Lives in general. 4 per ct.	Lives in general. 5 per ct.
56	9.717	8.988	10.334	9.529	10.025	9.258
57	9.425	8.736	10.012	9.253	9.718	8.994
58	9.140	8.489	9.692	8.976	9.416	8.732
59	8.845	8.232	9.358	8.687	9.101	8.458
60	8.540	7.963	9.039	8.406	8.789	8.184
61	8.241	7.700	8.739	8.144	8.490	7.922
62	7.950	7.442	8.453	7.895	8.201	7.668
63	7.669	7.193	8.166	7.643	7.917	7.418
64	7.382	6.938	7.870	7.382	7.626	7.160
65	7.090	6.676	7.566	7.111	7.328	6.893
66	6.792	6.408	7.252	6.831	7.022	6.619
67	6.489	6.134	6.930	6.541	6.709	6.337
68	6.201	5.872	6.596	6.239	6.398	6.055
69	5.933	5.628	6.253	5.926	6.093	5.777
70	5.670	5.389	5.897	5.599	5.783	5.494
71	5.418	5.158	5.564	5.293	5.491	5.225
72	5.180	4.940	5.261	5.013	5.220	4.976
73	4.940	4.719	4.998	4.770	4.969	4.744
74	4.724	4.521	4.792	4.581	4.758	4.551
75	4.487	4.302	4.582	4.388	4.534	4.345
76	4.253	4.084	4.367	4.189	4.310	4.136
77	4.024	3.871	4.145	3.983	4.084	3.927
78	3.768	3.631	3.913	3.767	3.840	3.699
79	3.512	3.390	3.668	3.536	3.590	3.463
80	3.260	3.152	3.402	3.285	3.331	3.218
81	3.017	2.921	3.145	3.041	3.081	2.981
82	2.792	2.706	2.905	2.812	2.848	2.759
83	2.600	2.523	2.699	2.615	2.649	2.569
84	2.473	2.403	2.559	2.480	2.516	2.441
85	2.371	2.306	2.552	2.476	2.461	2.391
86	2.281	2.222	2.518	2.446	2.399	2.334
87	2.154	2.103	2.431	2.365	2.292	2.338
88	1.955	1.912	2.294	2.236	2.124	2.074
89	1.698	1.664	2.108	2.059	1.903	1.861
90	1.417	1.392	1.873	1.833	1.645	1.612
91	1.154	1.136	1.628	1.596	1.391	1.366
92	0.835	0.824	1.349	1.325	1.092	1.074
93	0.477	0.471	1.071	1.054	0.774	0.762
94	0.240	0.238	0.799	0.788	0.519	0.513
95	0.000	0.000	0.544	0.537		
96	0.000	0.000	0.320	0.317		

TABLE IV. *Showing the Value of Annuities on Two Joint Lives, according to the Probabilities of the Duration of Human Life, among Males and Females collectively, reckoning interest at* 4 per cent.

Interest 4 per cent.

Difference of 0, 6, 12, and 18 years.

Ages.	Values.	Ages.	Values.	Ages.	Values.	Ages.	Values.
1- 1	12 252	1- 7	13.989	1-13	13.894	1-19	13.389
2- 2	13.583	2- 8	14.780	2-14	14.557	2-20	14.008
3- 3	14.558	3- 9	15.323	3-15	14.988	3-21	14.417
4- 4	15.267	4-10	15.685	4-16	15.259	4-22	14.671
5- 5	15.577	5-11	15.817	5-17	15.326	5-23	14.725
6- 6	15.820	6-12	15.887	6-18	15.354	6-24	14.740

Interest 4 per cent.

Survivor-ship.

Ages.	Values.	Ages	Values.	Ages.	Values.	Ages.	Values.
7- 7	16.003	7-13	15.914	7-19	15.351	7-25	14.727
8- 8	16.109	8-14	15.888	8-20	15.310	8-26	14.673
9- 9	16.152	9-15	15.824	9-21	15.244	9-27	14.590
10-10	16.141	10-16	15.729	10-22	15.149	10-28	14.484
11-11	16.087	11-17	15.617	11-23	15.033	11-29	14.357
12-12	15.982	12-18	15.477	12-24	14.889	12-30	14.202
13-13	15.855	13-19	15.327	13-25	14.736	13-31	14.045
14-14	15.701	14-20	15.164	14-26	14.566	14-32	13.874
15-15	15.535	15-21	15.001	15-27	14.392	15-33	13.700
16-16	15.361	16-22	14.832	16-28	14.216	16-34	13.520
17-17	15.196	17-23	14.665	17-29	14.042	17-35	13.340
18-18	15.023	18-24	14.491	18-30	13.860	18-36	13.141
19-19	14.854	19-25	14.320	19-31	13.687	19-37	13.934
20-20	14.682	20-26	14.144	20-32	13.512	20-38	12.720
21-21	14.525	21-27	13.976	21-33	13.345	21-39	12.505
22-22	14.360	22-28	13.807	22-34	13.173	22-40	12.286
23-23	14.194	23-29	13.635	23-35	12.997	23-41	12.073
24-24	14.020	24-30	13.455	24-36	12.801	24-42	11.873
25-25	13.849	25-31	13.284	25-37	12.599	25-43	11.683
26-26	13.671	26-32	13.108	26-38	12.387	26-44	11.485
27-27	13.495	27-33	12.935	27-39	12.170	27-45	11.284
28-28	13.323	28-34	12.763	28-40	11.953	28-46	11.072
29-29	13.148	29-35	12.586	29-41	11.742	29-47	10.847
30-30	12.965	30-36	12.390	30-42	11.543	30-48	10.606
31-31	12.795	31-37	12.192	31-43	11.359	31-49	10.365
32-32	12.624	32-38	11.988	32-44	11.170	32-50	10.128
33-33	12.456	33-39	11.779	33-45	10.978	33-51	9.905
34-34	12.286	34-40	11.568	34-46	10.775	34-52	9.679
35-35	12.109	35-41	11.361	35-47	10.557	35-53	9.452
36-36	11.904	36-42	11.156	36-48	10.314	36 54	9.207
37-37	11.683	37-43	10.953	37-49	10.059	37 55	8.951
38-38	11.452	38-44	10.741	38-50	9.805	38-56	8.685
39-39	11.209	39-45	10.519	39-51	9.558	39-57	8.404
40-40	10.964	40-46	10.286	40-52	9.308	40-58	8.124
41-41	10.732	41-47	10.049	41-53	9.066	41-59	7.839
42-42	10.531	42-48	9.813	42-54	8.830	42-60	7.569
43-43	10.346	43-49	9.581	43-55	8.597	43-61	7.318
44-44	10.154	44-50	9.351	44-56	8.354	44-62	7.075
45-45	9.954	45-51	9.129	45-57	8.101	45-63	6.836
46-46	9.736	46-52	8.897	46-58	7.841	46-64	6.586
47-47	9.497	47-53	8.658	47-59	7.563	47-65	6.323
48-48	9.236	48-54	8.402	48-60	7.281	48-66	6.048
49-49	8.966	49-55	8.139	49-61	7.008	49-67	5.764
50-50	8.707	50-56	7.874	50-62	6.749	50-68	5.487
51-51	8.469	51-57	7.613	51-63	6.505	51-69	5.221
52-52	8.230	52-58	7.351	52-64	6.256	52-70	4.953
53-53	7.994	53-59	7.083	53-65	6.004	53-71	4.694
54-54	7.748	54-60	6.814	54-66	5.743	54-72	4.455
55-55	7.495	55-61	6.555	55-67	5.474	55-73	4.231
56-56	7.229	56-62	6.299	56-68	5.204	56-74	4.043
57-57	6.924	57-63	6.045	57-69	4.936	57-75	3.844
58-58	6.678	58-64	5.788	58-70	4.664	58-76	3.637
59-59	6.388	59-65	5.519	59-71	4.395	59-77	3.430
60-60	6.104	60-66	5.249	60-72	4.149	60-78	3.210
61-61	5.844	61-67	4.984	61-73	3.927	61-79	2.974
62-62	5.600	62-68	4.729	62-74	3.747	62-80	2.744
63-63	5.367	63-69	4.482	63-75	3.563	63-81	2.557
64-64	5.128	64-70	4.231	64-76	3.370	64-82	2.396
65-65	4.881	65-71	3.982	65-77	3.180	65-83	2.252
66-66	4.626	66-72	3.750	66-78	2.974	66-84	2.123

Interest

Survivorship.

Interest 4 per cent.

Ages.	Values.	Ages.	Values.	Ages.	Values.	Ages.	Values.
67-67	4.362	67-73	3.527	67-79	2.743	67-85	2.010
68-68	4.103	68-74	3.340	68-80	2.514	68-86	1.910
69-69	3.851	69-75	3.147	69-81	2.324	69-87	1.798
70-70	3.593	70-76	2.946	70-82	2.155	70-88	1.661
71-71	3.345	71-77	2.752	71-83	2.004	71-89	1.464
72-72	3.128	72-78	2.558	72-84	1.875	72-90	1.189
73-73	2.935	73-79	2.355	73-85	1.768	73-91	0.937
74-74	2.797	74-80	2.172	74-86	1.692	74-92	0.708
75-75	2.648	75-81	2.017	75-87	1.605	75-93	0.575
76-76	2.490	76-82	1.877	76-88	1.497	76-94	0.481
77-77	2.340	77-83	1.756	77-89	1.339	77-95	0.421
78-78	2.170	78-84	1.639	78-90	1.097		
79-79	1.967	79-85	1.524	79-91	0.863		
80-80	1.758	80-86	1.416	80-92	0.638		
81-81	1.600	81-87	1.320	81-93	0.511		
82-82	1.472	82-88	1.225	82-94	0.427		
83-83	1.364	83-89	1.094	83-95	0.379		
84-84	1.276	84-90	0.902				
85-85	1.212	85-91	0.725				
86-86	1.172	86-92	0.556				
87-87	1.127	87-93	0.459				
88-88	1.071	88-94	0.396				
89-89	0.949	89-95	0.364				
90-90	0.718						
91-91	0.516						
92-92	0.326						
93-93	0.236						
94-94	0.190						
95-95	0.024						

TABLE V. *Showing the Values of two Joint Lives, according to the Probabilities of the Duration of Human Life among Males and Females collectively.*

Interest 4 per cent.

Difference of age 24, 30, 36, and 42 years.

Ages.	Values.	Ages.	Values.	Ages.	Values.	Ages.	Values.
1-25	12.832	1-31	12.196	1-37	11.465	1-43	10.546
2-26	13.409	2-32	12.730	2-38	11.913	2-44	10.946
3-27	13.778	3-33	13.066	3-39	12.164	3-45	11.168
4-28	14.003	4-34	13.264	4-40	12.284	4-46	11.260
5-29	14.037	5-35	13.277	5-41	12.242	5-47	11.183
6-30	14.033	6-36	13.242	6-42	12.185	6-48	11.064
7-31	14.006	7-37	13.170	7-43	12.112	7-49	10.915
8-32	13.944	8-38	13.059	8-44	12.004	8-50	10.743
9-33	13.855	9-39	12.913	9-45	11.865	9-51	10.560
10-34	13.741	10-40	12.743	10-46	11.694	10-52	10.357
11-35	13.604	11-41	12.563	11-47	11.493	11-53	10.140
12-36	13.428	12-42	12.379	12-48	11.259	12-54	9.898
13-37	13.234	13-43	12.196	13-49	11.011	13-55	9.644
14-38	13.023	14-44	11.997	14-50	10.759	14-56	9.371
15-39	12.798	15-45	11.787	15-51	10.514	15-57	9.087
16-40	12.570	16-46	11.562	16-52	10.264	16-58	8.799

Interest 4 per cent.

Ages.	Values.	Ages.	Values.	Ages.	Values.	Ages.	Values.
17-41	12.351	17-47	11.328	17-53	10.018	17-59	8.503
18-42	12.146	18-48	11.076	18-54	9.761	18-60	8.208
19-43	11.951	19-49	10.819	19-55	9.500	19-61	7.928
20-44	11.751	20-50	10.567	20-56	9.228	20-62	7.658
21-45	11.550	21-51	10.332	21-57	8.953	21-63	7.396
22-46	11.335	22-52	10.092	22-58	8.675	22-64	7.127
23-47	11.107	23-53	9.852	23-59	8.385	23-65	6.851
24-48	10.862	24-54	9.602	24-60	8.097	24-66	6.566
25-49	10.612	25-55	9.347	25-61	7.823	25-67	6.275
26-50	10.364	26-56	9.080	26-62	7.557	26-68	5.986
27-51	10.130	27-57	8.807	27-63	7.297	27-69	5.702
28-52	9.894	28-58	8.534	28-64	7.032	28-70	5.415
29-53	9.659	29-59	8.250	29-65	6.761	29-71	5.136
30-54	9.413	30-60	7.967	30-66	6.481	30-72	4.881
31-55	9.167	31-61	7.702	31-67	6.197	31-73	4.646
32-56	8.912	32-62	7.446	32-68	5.947	32-74	4.453
33-57	8.651	33-63	7.196	33-69	5.642	33-75	4.251
34-58	8.389	34-64	6.942	34-70	5.364	34-76	4.040
35-59	8.114	35-65	6.679	35-71	5.093	35-77	3.833
36-60	7.833	36-66	6.402	36-72	4.840	36-78	3.605
37-61	7.561	37-67	6.115	37-73	4.603	37-79	3.352
38-62	7.296	38-68	5.828	38-74	4.405	38-80	3.098
39-63	7.033	39-69	5.543	39-75	4.195	39-81	2.889
40-64	6.763	40-70	5.254	40-76	3.975	40-82	2.710
41-65	6.492	41-71	4.977	41-77	3.762	41-83	2.553
42-66	6.225	42-72	4.730	42-78	3.539	42-84	2.418
43-67	5.957	43-73	4.507	43-79	3.295	43-85	2.305
44-68	5.689	44-74	4.322	44-80	3.052	44-86	2.203
45-69	5.426	45-75	4.128	45-81	2.854	45-87	2.083
46-70	5.153	46-76	3.921	46-82	2.684	46-88	1.933
47-71	4.884	47-77	3.715	47-83	2.533	47-89	1.708
48-72	4.633	48-78	3.489	48-84	2.396	48-90	1.385
49-73	4.398	49-79	3.238	49-85	2.277	49-91	1.090
50-74	4.205	50-80	2.990	50-86	2.171	50-92	0.818
51-75	4.008	51-81	2.792	51-87	2.050	51-93	0.662
52-76	3.803	52-82	2.623	52-88	1.901	52-94	0.551
53-77	3.605	53-83	2.475	53-89	1.681	53-95	0.468
54-78	3.389	54-84	2.344	54-90	1.366		
55-79	3.150	55-85	2.232	55-91	1.078		
56-80	2.909	56-86	2.130	56-92	0.810		
57-81	2.710	57-87	2.010	57-93	0.655		
58-82	2.539	58-88	1.864	58-94	0.546		
59-83	2.385	59-89	1.644	59-95	0.464		
60-84	2.248	60-90	1.333				
61-85	2.135	61-91	1.050				
62-86	2.037	62-92	0.789				
63-87	1.916	63-93	0.639				
64-88	1.790	64-94	0.533				
65-89	1.585	65-95	0.456				
66-90	1.290						
67-91	1.017						
68-92	0.764						
69-93	0.617						
70-94	0.514						
71-95	0.411						

Survivorship.

The values of joint lives in these tables have been computed for only one rate of interest; and of single lives in Table III. for only two rates of interest. The following rules will show, that it would be a needless labour to compute these values (in strict conformity to the observations) for any other rates of interest.

Account of a method of deducing, from the correct values (according to any observations) of any single or joint Lives at one rate of Interest, the same values at other rates of Interest.

Preliminary Problems.

Prob. I. The expectation given of a single life by any table of observations, to find its value, supposing the decrements of life equal, at any given rate of interest.

Solution. Find the value of an annuity certain for a number of years equal to twice the expectation. Multiply this value by the perpetuity increased by unity, and divide the product by twice the expectation: The quotient subtracted from the perpetuity will be the value required.

Example. The expectation of a male life aged 10, by the Sweden observations, is 43.94. Twice this expectation is 87.88. The value of an annuity certain for 87.88 years is (reckoning interest at 4 per cent.) 24.200. The product of 24.200 into 26 (the perpetuity increased by unity) is 629.2, which, divided by 87.88, gives 7.159. And this quotient subtracted from 25 (the perpetuity) gives 17.84 years purchase, the value of a life aged ten, deduced from the expectation of life at that age, according to the Sweden observations. (See the Tables in Dr Price on Reversions, vol. ii.).

Prob. II. Having the expectations given of any two lives by any table of observations, to deduce from thence the value of the joint lives at any rate of interest, supposing an equal decrement of life.

Solution. Find the difference between twice the expectation of the youngest life and twice the expectation of the oldest life increased by unity and twice the perpetuity. Multiply this difference by the value of an annuity certain for a time equal to twice the expectation of the oldest life; and by twice the same expectation divide the product, reserving the quotient.

From twice the perpetuity subtract the reserved quotient, and multiply the remainder by the perpetuity increased by unity. This last product divided by twice the expectation of the youngest life, and then subtracted from the perpetuity, will be the required value.

When twice the expectation of the youngest life is greater than twice the expectation of the oldest life increased by unity and twice the perpetuity, the reserved quotient, instead of being subtracted from twice the perpetuity, must be added to it, and the sum, not the difference, multiplied by the perpetuity increased by unity.

Example. Let the joint lives proposed be a female life aged 10, and a male life aged 15; and let the table of observations be the Sweden table for lives in general, and the rate of interest 4 per cent. Twice the expectations of the two lives are 90.14 and 83.28.

Twice the expectation of the oldest life, increased by unity, and twice the perpetuity, is 134.28, which lessened by 90.14 (twice the expectation of the youngest life), leaves 44.14 for the reserved remainder. This remainder multiplied by 24.045 (the value of an annuity certain for 83.28 years), and the product divided by 83.28 (twice the expectation of the oldest life), gives 12.744, the quotient to be reserved; which subtracted from double the perpetuity, and the remainder (or 37.255) multiplied by the perpetuity increased by unity (or by 26) gives 968.630, which divided by 90.14 (twice the expectation of the youngest life) and the quotient subtracted from the perpetuity, we have 14.254 for the required value.

The value of an annuity certain, when the number of years is a whole number with a fraction added (as will be commonly the case) may be best computed in the following manner. In this example the number of years is 83.28. The value of an annuity certain for 83 years is 24.035. The same value for 84 years is 24.072. The difference between these two values is 0.37; which difference multiplied by .28 (the fractional part of the number of years), and the product (.0103) added to the least of the two values, will give 24.045 the value for 83.28 years.

General Rule. Call the correct value (supposed to be computed for any rate of interest) the first value. Call the value deduced (by the preceding problems) from the expectations at the same rate of interest, the second value. Call the value deduced from the expectations for any other rate of interest the third value.

Then the difference between the first and second values added to or subtracted from the third value, just as the first is greater or less than the second, will be the value at the rate of interest for which the third value has been deduced from the expectations.

The following examples will make this perfectly plain.

Example I. In the two last tables the correct values are given of two joint lives among mankind at large, without distinguishing between males and females, according to the Sweden observations, reckoning interest at 4 per cent. Let it be required to find from these values the values at 3 per cent. and let the ages of the joint lives be supposed 10 and 10.

The correct value by Table IV. (reckoning interest at 4 per cent.) is 16.141. The expectation of a life aged 10 is 45.07. The value deduced from this expectation at 4 per cent. by Prob. II. is 14.539. The value deduced by the same problem from the same expectation at 3 per cent. is 16.808. The difference between the first and second values is 1.602, which, added to the third value (the first being greater than the second), makes 18.410, the value required.

Example II. Let the value be required of a single male life aged 10, at 3 per cent. interest, from the correct value at 4 per cent. according to the Sweden observations.

First, or correct value at 4 per cent. (by Table III.) is 18.674. The expectation of a male life aged 10 is 43.94.

The second value (or the value deduced from this expectation by Prob. I.) is 17.838.

The third value (or the value deduced from the same expectation at 3 per cent.) is 21.277.

The difference between the first and second is .836; which (since the first is greater than the second) must be added to the third; and the sum (that is, 22.113) will be the value required.

The

Survivorship, Surya.

The third value at 5 per cent. is 15.286; and the difference added to 15.286 makes 16.122 the value of a male life aged 10 at 5 per cent. according to the Sweden obſervations. The exact value at 5 per cent. is (by Table III.) 16.014.

Again: The difference between 16.014 (the correct value at 5 per cent.), and 15.286 (the value at the ſame intereſt deduced from the expectation), is .728; which, added (becauſe the firſt value is greater than the ſecond) to 13.335 (the value deduced at 6 per cent. from the expectation) gives 14.063, the value of the ſame life, reckoning intereſt at 6 per cent.

Theſe deductions, in the caſe of ſingle lives particularly, are ſo eaſy, and give the true values ſo nearly, that it will be ſcarcely ever neceſſary to calculate the exact values (according to any given obſervations) for more than one rate of intereſt.

If, for inſtance, the correct values are computed at 4 per cent. according to any obſervations, the values at 3, $3\frac{1}{2}$, $4\frac{1}{2}$, 5, 6, 7, or 8 per cent. may be deduced from them by the preceding rules as occaſion may require, without much labour or any danger of conſiderable errors. The values thus deduced will ſeldom differ from the true values ſo much as a tenth of a year's purchaſe. They will not generally differ more than a 20th or 30th of a year's purchaſe. In joint lives they will differ leſs than in ſingle lives, and they will come equally near to one another whatever the rates of intereſt are.

The preceding tables furniſh the means of determining the exact differences between the values of annuities, as they are made to depend on the ſurvivorſhip of any male or female lives; which hitherto has been a *deſideratum* of conſiderable conſequence in the doctrine of life-annuities. What has made this of conſequence is chiefly the multitude of ſocieties lately eſtabliſhed in this and foreign countries for providing annuities for widows. The general rule for calculating from theſe tables the value of ſuch annuities is the following.

Rule. "Find in Table III. the value of a female life at the age of the wife. From this value ſubtract the value in Table IV. of the joint continuance of two lives at the ages of the huſband and wife. The remainder will be the value in a ſingle preſent payment of an annuity for the life of the wife, ſhould ſhe be left a widow. And this laſt value divided by the value of the joint lives increaſed by unity, will be the value of the ſame annuity in annual payments during the joint lives, and to commence immediately."

Example. Let the age of the wife be 24, and of the huſband 30. The value in Table III. (reckoning intereſt at 4 per cent.) of a female life aged 24, is 17.252. The value in Table IV. of two joint lives aged 24 and 30, is 13.455, which ſubtracted from 17.252 leaves 3.797, the value in a ſingle preſent payment of an annuity of 1l. for the life of the wife after the huſband; that is, for the life of the widow. The annuity, therefore, being ſuppoſed 20l. its value in a ſingle payment is 20 multiplied by 3.797, that is, 75.94l. And this laſt value divided by 14.455 (that is, by the value of the joint lives increaſed by unity), gives 5.25, the value in annual payments beginning immediately, and to be continued during the joint lives of an annuity of 20l. to a wife aged 24 for her life, after her huſband aged 30.

SURYA, the orb of the ſun perſonified and adored by a ſect of Hindoos as a god. He ſeems to be the ſame divinity with the Phœbus of Greece and Rome; and the ſect who pay him particular adoration are called *Sauras*. Their poets and painters deſcribe his car as drawn by ſeven green horſes, preceded by Arun, or the *Dawn*, who acts as his charioteer, and followed by thouſands of genii worſhipping him and modulating his praiſes. He has a multitude of names, and among them twelve epithets or titles, which denote his diſtinct powers in each of the twelve months; and he is believed to have deſcended frequently from his car in a human ſhape, and to have left a race on earth, who are equally renowned in the Indian ſtories with the Heliadai of Greece: it is very ſingular, that his two ſons called *Aſwinau* or *Aſwinicumarau*, in the dual, ſhould be conſidered as twin-brothers, and painted like Caſtor and Pollux; but they have each the character of Æſculapius among the gods, and are believed to have been born of a nymph, who, in the form of a mare, was impregnated with ſunbeams.

Surya || Suſſex.

Aſiatic Reſearches, vol. i. p. 262 and 263.

SUS, the Hog, a genus of quadrupeds belonging to the claſs of mammalia and order of belluæ. See Mammalia *Index*.

SUSA, the ancient royal reſidence of the kings of Perſia, built by Darius Hyſtaſpis, according to Pliny; though he probably only reſtored it, being a very ancient city, founded by Tithonus father of Memnon. It was in compaſs 120 ſtadia, of an oblong quadrangular form, with a citadel called *Memnoneum*. In ſcripture it is called *Suſan*, the royal citadel, from the great number of lilies growing in that diſtrict (Athenæus); ſituated on the river Uhlai, or Eulæus (Daniel): and the Spaniards call at this day a lily *aſuſena* (Pinedo). Suſa was the winter, as Ecbatana was the ſummer, reſidence of the kings of Perſia, (Xenophon, Strabo, Plutarch). Here the kings kept their treaſure, (Herodotus). Now called *Tuſter*.

SUSPENSION, in *Scots Law*. See Law, N° clxxxv. 5, 6, and 7.

SUSSEX, a county of England, deriving its name from its ſituation in reſpect of the other Saxons, and called *Suſſex*, i. e. the country of the South Saxons, has Hampſhire on the weſt, the Britiſh channel on the ſouth, Surry on the north, and Kent on the eaſt. Its length is 65 miles, its breadth 30, and its circumference 170. It is divided into 6 rapes, and theſe into 65 hundreds, in which are 342 pariſhes, of which 123 are vicarages, one city, 16 market-towns, 1,140,000 acres, and about 159,311 ſouls. It has few good ports, though it lies along the channel for 65 miles, which is its greateſt length, the coaſt being encumbered in many places with rocks; and where it is more open, ſuch quantities of ſand are thrown upon it by the ſouth-weſt winds, and the harbours ſo choked up, that they will not admit veſſels of any great draught or burden. The county is well watered by the rivers Arun, Adar, Ouſe, Rother, Lavant, Cuckmeer, Aſhburn, and Aſten, by which it is well ſupplied with fiſh, as well as from the ſea. Hence different places of the county are famed for different ſorts of fiſh, as the Arun for mullets, which enter it from the ſea in ſummer in ſhoals, and by feeding upon a particular kind of herb become extremely delicious: Chicheſter for lobſters, Selſey for cockles, Amberley for trout, Pulborough for eels, Rye for herrings, and

Gough's edition of Camden's Britannia, vol. i. p. 192.

and the county in general for carp. It is remarkable, that all the rivers above mentioned riſe and fall into the ſea within the county.

The air, as well as the ſoil, is various in different parts of the county. Upon the coaſt the air is aguiſh, upon the hills and downs pleaſant and wholeſome; but ſomewhat moiſt and foggy in the valleys, the ſoil being deep and rich, and the vegetation in ſummer very vigorous. The downs in ſome places are very fertile in corn and graſs; in others they feed great flocks of ſheep, whoſe fleſh and wool are very fine; but of the latter no inconſiderable quantity is clandeſtinely exported to France. In the Weald and the valleys the roads are very deep, eſpecially in winter. In the north quarter are many woods, and ſome foreſts in other places; whence the king's yards are ſupplied with the largeſt and beſt timber in England, beſide what is made into charcoal and conſumed in the iron-works; for on the eaſt ſide is plenty of iron ore, with furnaces, forges, and mills for manufacturing it. The gunpowder of this county is ſaid to excel that of any other. Thoſe delicious birds called *wheat-ears* are bred in this ſhire; they are not bigger than a lark, but very fat. That part now called the *Wild* or *Weald* of Suſſex, was anciently a mere deſert for hogs and deer, of great extent, taking in a part of Kent and Surry; and was called *Anderida Silva*, *Coid Andred*, and *Andradſwald*, from Anderida an adjoining city. This county is in the home-circuit and dioceſe of Chicheſter, giving title of earl to the family of Yelverton, and ſends 28 members to parliament, viz. two for the county, two for the city of Chicheſter, and two for each of the following towns, Horſham, Lewes, Bramber, Eaſt-Grinſtead, Midhurſt, Shoreham, Staining, Arundel, Haſtings, Rye, Winchelſea, and Seaford; of which the four laſt are cinque ports.

SUTHERLAND, one of the moſt northerly counties of Scotland, bordering on Caithneſs to the eaſt, and bounded by the ocean on the north, the country of Aſſynt on the weſt, Roſs-ſhire on the ſouth, and by the German ſea on the ſouth-eaſt. It ſtretches about 70 miles in length, and 40 in breadth; is generally hilly, though in many parts arable; well watered with ſmall rivers and ſtreams replete with fiſh, and containing about 60 lakes, the habitation of various fiſh, ſwans, ducks, geeſe, &c. One of the largeſt of theſe is Lochſhin, extending 18 miles in length. Some of them are interſperſed with ſmall verdant iſlands, which in ſummer yield a very agreeable proſpect. On the coaſt are many commodious harbours, and all the bays ſwarm with fiſh. Sutherland affords iron-ſtone, freeſtone, limeſtone, marble and ſlate, in abundance. Turf and peat are the common fuel. Lead ore, and ſome copper ore have been met with in ſome parts of the county.

The air is ſo temperate, and the ſoil ſo good, that ſaffron has here been brought to perfection. Many parts of the country are remarkably fruitful in corn, and the paſturage is everywhere excellent. Deer and ſome other game are abundant in Sutherland. On the hills are fed numerous flocks of ſheep and black cattle. The northern part, called *Strathnaver*, and ſeparated from the reſt by a ridge of mountains, is bounded on the north by the Deucaledonian ſea, on the weſt by the channel called the *Minch*, on the eaſt by Caithneſs, and on the ſouth by Aſſynt. The length from eaſt to weſt, is 34 miles; but the breadth from north to ſouth does not exceed 12 in ſome places. It is very hilly; and the mountains are ſo high, that the ſnow remains on the tops of them till midſummer. It is watered by the Naver, from whence it derives its name: this diſtrict gives a title to the eldeſt ſon of the earl of Sutherland. Strathnaver has many freſh-water lakes or lochs; the chief of which are Loch Naver and Loch Lyel: there are ſeveral iſlands on the northern coaſt. In various parts of the country there are monuments of victories obtained over the Danes or other foreign invaders. The inhabitants are hardy, bold, and enterpriſing; courteous to ſtrangers; cheerful, open, frugal, and induſtrious. The ſalmon-fiſhery in this county is conſiderable, as well as the trade in black cattle, ſheep, and horſes, at the neighbouring fairs; corn, barley, ſalmon, butter, cheeſe, wool, hides, and tallow, are exported. Dornoch is the capital of the county. The population of Sutherland in 1801 amounted to 23,000. The following table ſhews the population at two different periods*.

* *Statiſt. Hiſt.* vol. xx.

	Pariſhes.	Population in 1755.	Population in 1790—1798.
	Aſſynt	1934	3000
	Clyne	1406	1660
	Creich	1705	1730
	Durneſs	1000	1182
5	Dornoch	2780	2541
	Edderachyllis	869	1024
	Farr	2800	2600
	Golſpie	1790	1700
	Kildonan	1433	1365
10	Lairg	1010	1350
	Loth	1193	1370
	Rogart	1761	2000
13	Tongue	1093	1439
		20,774	22,961
			20,774
		Increaſe,	2,187

SUTLER, in *War*, one who follows the army, and furniſhes the troops with proviſion. Sutlers pitch their tents, or build their huts, in the rear of each regiment, and about head-quarters.

SUTRIUM, in *Ancient Geography*, a famous city, and an ancient colony of the Romans, the key of Etruria; founded about ſeven years after the taking of Rome by the Gauls (Velleius). Now *Sutri* in St Peter's patrimony, on the river Pozzolo; ſurrounded on every ſide with rocks, 24 miles to the north-weſt of Rome.

SUTTON, Samuel, was born at Alfreton in Derbyſhire, and going into the army ſerved under the duke of Marlborough in Queen Anne's wars with great credit. He afterwards came to London, commenced brewer, and kept a coffee houſe in Alderſgate-ſtreet, which was well frequented by the learned men of that time, by whom Mr Sutton was much reſpected, as a man of ſtrong natural parts and uncultivated genius. About the year 1740 he ſchemed a very ſimple and natural method for extracting the foul air from the wells of ſhips, by pipes communicating with the fire-places of the coppers; which operated as long as any fire was kept burning for the ſhip's uſe. He took out a patent in 1744, to ſecure the profits of his invention; and died about the year 1752.

SUTURE,

Suture || Swammerdam

SUTURE, in *Anatomy*, a kind of articulation peculiar to the cranium or ſkull. See ANATOMY, Part I. Sect. ii. *paſſim*.

SUTURE, in *Surgery*, a method of uniting the lips of wounds together. See SURGERY.

SWABBER, an inferior officer on board ſhips of war, whoſe employment it is to ſee that the decks are kept clean and neat.

SWABIA. See SUABIA.

SWALLOW, a genus of birds. See HIRUNDO, ORNITHOLOGY *Index*. See alſo MIGRATION.

SWALLOW-Wort. See ASCLEPIAS, BOTANY *Index*.

SWAMMERDAM, JOHN, a celebrated and learned natural philoſopher, was the ſon of John James Swammerdam, an apothecary and famous naturaliſt of Amſterdam, and was born in 1637. His father intended him for the church, and with this view had him inſtructed in Latin and Greek; but he, thinking himſelf unequal to ſo important a taſk, prevailed with his father to conſent to his applying himſelf to phyſic. As he was kept at home till he ſhould be properly qualified to engage in that ſtudy, he was frequently employed in cleaning his father's curioſities, and putting every thing in its proper place. This inſpired our author with an early taſte for natural hiſtory; ſo that, not content with the ſurvey of the curioſities which his father had purchaſed, he ſoon began to make a collection of his own, which he compared with the accounts given of them by the beſt writers. When grown up, he ſeriouſly attended to his anatomical and medical ſtudies; yet ſpent part of the day and the night in diſcovering, catching, and examining the flying inſects proper to thoſe times, not only in the province of Holland, but in thoſe of Guelderland and Utrecht. Thus initiated in natural hiſtory, he went to the univerſity of Leyden in 1651; and in 1653 was admitted a candidate of phyſic in that univerſity. His attention being now engaged by anatomy, he began to conſider how the parts of the body, prepared by diſſection, could be preſerved, and kept in conſtant order for anatomical demonſtration; and herein he ſucceeded, as he had done before in his nice contrivances for diſſecting and managing the minuteſt inſects. Our author afterwards made a journey into France, where he ſpent ſome time at Saumur, and where he became acquainted with ſeveral learned men. In 1667 he returned to Leyden, and took his degree of Doctor of Phyſic. The next year the grand duke of Tuſcany being in Holland in order to ſee the curioſities of the country, came to view thoſe of our author and his father; and on this occaſion Swammerdam made ſome anatomical diſſections of inſects in the preſence of that prince, who was ſtruck with admiration at our author's great ſkill in managing them, eſpecially at his proving that the future butterfly lay with all its parts neatly folded up in a caterpillar, by actually removing the integuments that covered the former, and extricating and exhibiting all its parts, however minute, with incredible ingenuity, by means of inſtruments of inconceivable fineneſs. On this occaſion the duke offered our author 12,000 florins for his ſhare of the collection, on condition of his removing them himſelf into Tuſcany, and coming to live at the court of Florence; but Swammerdam, who hated a court life, declined his highneſs's propoſal. In 1663, he publiſhed a General Hiſtory of Inſects. About this time, his father began to take offence at his inconſiderately neglecting the practice of phyſic, which might have ſupported him in affluence; and would neither ſupply him with money nor clothes. This reduced him to ſome difficulties. In 1675 he publiſhed his Hiſtory of the Ephemeras; and his father dying the ſame year, left him a fortune ſufficient for his ſupport; but he did not long ſurvive him, for he died in 1682. Gaubius gave a tranſlation of all his works from the original Dutch into Latin, from which they were tranſlated into Engliſh, in folio, in 1758. The celebrated Boerhaave wrote his life.

Swammerdam || Sweden.

SWAN. See ANAS, ORNITHOLOGY *Index*.

SWANPAN, or Chineſe ABACUS; an inſtrument for performing arithmetical operations. See ABACUS.

SWANEMOTE, SWAINMOTE, or SWEINMOTE. See *FOREST-Courts*.

SWEARING. See OATH.

SWEAT, a ſenſible moiſture iſſuing from the pores of the ſkins of living animals. See PHYSIOLOGY, N° 286.

SWEATING SICKNESS, a diſorder which appeared in England about the year 1481, and was by foreigners called the *Engliſh ſweat*. See MEDICINE, N° 51.

SWEDEN, the ſmalleſt of the northern ſtates of Europe, occupies the greater part of the north-weſtern corner of that portion of the globe, lying between Norway and the gulf of Bothnia. Before the treaty concluded in 1809, between Sweden and Ruſſia, the Swediſh territory extended over a conſiderable tract of country on the eaſt of the gulf of Bothnia; but by that treaty, the whole of theſe provinces were ceded to Ruſſia. At preſent the boundaries of Sweden are, Norway and Lapland to the north; to the weſt Norway, from which it is ſeparated by the mountains; the Baltic to the ſouth; and to the eaſt the gulf of Bothnia, the ſea of Aland, and the rivers of Tornea and Muonio, which ſeparate it from the Ruſſian empire. From north to ſouth it lies between the latitudes of 69° 30′ and 55° 20′; and it extends from the 12th degree to about the 24th degree of longitude eaſt from Greenwich. Formerly its extent in Britiſh miles was computed at 1150 in length, and 600 in breadth, and its area at about 210,000 ſquare miles. Its length continues undiminiſhed; but its breadth is probably leſſened at leaſt one half, and we can ſcarcely eſtimate its preſent extent at more than 110,000 ſquare miles. The following table will ſhew the preſent diviſions of the Swediſh territories.

I. Situation and extent.

Provinces.

Sweden.

2 Division.

Provinces.	*Subdivisions.*	*Chief Towns.*
SWEDEN PROPER.	Upland. Sudermanland. Nerike. Weſtmanland. Dalecarlia.	STOCKHOLM.
GOTHLAND.	Weſt Gothland. Eaſt Gothland. South Gothland.	Gottenburgh.
WEST NORLAND.	Jemtland. Angermanland. Medelpad. Halſingland. Gaſtrikland. Hergeadalen.	
WEST BOTHNIA.	- - -	Tornea.
SWEDISH LAPLAND.	Aſele Lappmark. Umea Lappmark. Pitea Lappmark. Lulea Lappmark. Tornea Lappmark. Kemi Lappmark.	
SWEDISH POMERANIA (A).	- - -	Stralſund.

The only colonial territory belonging to Sweden is the iſland of St Bartholomew, in the Weſt Indies.

3 Face of the country. Sweden is diverſified in a moſt pictureſque manner, with extenſive lakes, large rivers, winding ſtreams, cataracts, gloomy foreſts, fertile vales, ſtupendous rocks, and cultivated fields. It poſſeſſes more navigable rivers than the neighbouring countries of Norway and Denmark.

4 Soil. Sweden is by no means remarkable for the fertility of its ſoil, moſt of the country being rocky and unproductive. The valleys and the banks of the rivers afford the beſt land for tillage.

5 Mountains. The principal mountains belonging to Sweden are thoſe of the elevated chain which divides it from Norway, and which branch off in a ſouth-eaſterly direction. One of the higheſt of theſe is Swucku.

6 Rivers. The chief rivers are the Gotha connecting Lake Wener with the Categat; the Motala, forming the outlet of Lake Weter; the Dahl riſing in the Norwegian mountains, and flowing through Dalecarlia into the gulf of Bothnia, and the Tornea forming the north-eaſtern boundary, and emptying itſelf into the gulf of Bothnia at the town of the ſame name.

7 Lakes. There are ſeveral conſiderable lakes in Sweden, chiefly in the province of Sweden Proper. The moſt remarkable are Wener, Weter, and Maela, on the banks of which laſt ſtands the city of Stockholm.

8 Foreſts. Sweden abounds with foreſts, eſpecially in Dalecarlia, and on the borders of the lakes.

9 Climate and ſeaſons. The climate and ſeaſons of Sweden nearly reſemble thoſe of the ſame latitudes in Ruſſia. The winters are in moſt places extremely ſevere, and the ſummers ſhort and ſudden. The gulf of Bothnia is generally frozen over during winter, ſo as to admit of travellers paſſing over into Finland, and Eaſt Bothnia. The ſummer, though ſhort, is generally hot, and ſeldom cloudy or inconſtant. In the higher latitudes the ſun of courſe is ſeen in the middle of ſummer for ſeveral days together, and the nights of winter are proportionably long. See LAPLAND.

10 Natural hiſtory. Much of the natural hiſtory of Sweden has been already given under the article LAPLAND. In the more ſouthern provinces there are found in the foreſts the bear, lynx, wolf, beaver, otter, glutton, and flying ſquirrel. The Swediſh horſes are commonly ſmall, but ſpirited, and are conſidered as ſuperior to thoſe of Germany for cavalry. The cattle and ſheep preſent little remarkable, being ſimilar to thoſe of the neighbouring nations. Seals are found in the gulf of Bothnia; and the lakes and rivers of Sweden produce pikes that are remarkably large, and which are ſalted and pickled for exportation. The

(A) That diſtrict of Germany, called *Swediſh Pomerania*, was long in poſſeſſion of the Swediſh monarchs; till, in the conteſts with France and Ruſſia, it was taken poſſeſſion of by the former. By the late treaty (in 1809) between France and Sweden, Pomerania has been reſtored to its old maſter.

The map of Sweden is attached to that of Denmark and Norway, in Plate CLXX.

Sweden.

The forests produce a great variety of game, especially the large black cock, called in Scotland the cock of the forest. Among the reptiles the *rana bombina*, and the *coluber cherfea*, are considered as almost peculiar to Sweden.

The principal vegetable productions of Sweden are its immense forests of pine and fir trees, though the country is not destitute of a great variety of shrubs and plants common to it with Denmark and Russia.

The principal riches of the natural history of Sweden are to be found in the mineral kingdom. It produces crystals, amethysts, topazes, porphyry, lapis lazuli, agate, cornelian, marble, and other fossils. The chief wealth of the country, however, arises from her mines of silver, copper, lead, and iron. The last mentioned metal employs not fewer than 450 forges, hammering-mills, and smelting houses. A kind of a gold mine has likewise been discovered in Sweden, but so inconsiderable, that from the year 1741 to 1747, it produced only 2398 ducats, each valued at 9s. 4d. sterling. The first gallery of one silver mine is 100 fathoms below the surface of the earth; the roof is supported by prodigious oaken beams, and from thence the miners descend about 40 fathoms to the lowest vein. This mine is said to produce 20,000 crowns a year. The product of the copper mines is uncertain; but the whole is loaded with vast taxes and reductions to the government, which has no other resources for the exigencies of the state. Those subterraneous mansions are astonishingly spacious, and at the same time commodious for their inhabitants, so that they seem to form a hidden world. The waterfalls in Sweden afford excellent conveniency for turning mills for forges; and for some years the exports of iron from Sweden brought in 300,000l. sterling.

There are likewise in Sweden some silver mines, of which that of Sahlberg is the richest, as well as the most ancient. It existed so early as 1188, and during the whole of the 14th century, it yielded 24,000 marks of silver *per annum*. In the 15th century the quantity was diminished to 20,000. In the reign of Charles X. it gave only 2,000; and it furnishes at present still less, the ore yielding only one ounce of pure metal per quintal. The chief gallery, where the purest silver was obtained, having fallen in, is not yet cleared, notwithstanding their incessant labour. They are also digging pits in a perpendicular direction, in order to arrive at the principal vein, which extends itself from the north to the south-east. Formerly lead employed in separating the metal was imported from England; but the mine furnishes at present a sufficient quantity for the purpose. The most remarkable mineral waters in Sweden are those of Medewi in East Gothland.

11 Early history uncertain.

The early history of Sweden is not less involved in fable than that of most other nations. Some historians have pretended to give regular catalogues of the princes who reigned in Sweden in very early times; but they differ so much that no credit can be given to them. All indeed agree that ancient Scandinavia was first governed by judges elected for a certain time by the voice of the people. Among these temporary princes the country was divided, until, in the year of the world 2954, according to some, or 1951, according to others, Eric, or, if we believe Puffendorf, Sueno, was raised to the supreme power, with the prerogatives of all the temporary magistrates united in his person for life, or until his conduct should merit deposition.

Sweden.

An. 1366.

From this very early period till the year 1366 of the Christian era, the histories of Sweden present us with nothing but what is common to all nations in their early periods, viz. the endless combats of barbarians, tending to no other purpose than the effusion of blood. At the time just mentioned, however, Albert of Mecklenburg, having concluded a peace between Sweden and Denmark, which had been at violent war for some time before, was proclaimed king of Sweden. The peace was of short duration, being broken in 1368; on which Albert entered into an offensive and defensive league with the earl of Holstein, the Jutland nobility, the dukes of Slesvick, Mecklenburg, and the Hanse-towns, against the kings of Denmark and Norway. Albert proved very successful against Waldemar king of Denmark at that time, driving him entirely out of his dominions; but he himself was defeated by the king of Norway, who laid siege to his capital. Soon after this, a new treaty was concluded, by which Albert was allowed to enjoy the crown of Sweden in peace. Having formed a design however of rendering himself absolute, he so displeased his subjects that Margaret of Norway was proclaimed queen of Sweden by the malecontents. A war immediately ensued, in which Albert was defeated and taken prisoner; but as the princes of Mecklenburg, the earls of Holstein, and the Hanse-towns, entered into a league in his favour, the war raged with more fury than ever.

12 Albert of Mecklenburg declared king.

13 War with Denmark and Norway.

14 Is defeated and taken prisoner by Margaret of Norway.

15 Set at liberty. An. 1394.

At length, in 1394, the contending parties were reconciled. Albert was set at liberty, on condition that he should in three years give up to Margaret all pretensions to the city of Stockholm; and the Hanse-towns engaged to pay the sum of 60,000 marks of silver if Albert should break that treaty. Not long after this, Eric the son of Albert died; and he, having no other child, did not think it worth his while to contend for the kingdom of Sweden: he therefore acquiesced in the pretensions of Margaret, and passed the remainder of his days at Mecklenburg.

16 Margaret is succeeded by Eric, a cruel tyrant. An. 1415.

Margaret died in 1415, and was succeeded by Eric of Pomerania. This prince's reign was cruel and oppressive. The consequence of this was a revolt; and Charles Canutson, grand marescal of Sweden and governor of Finland, having joined the malecontents, was declared commander in chief of their army. Eric was now formally deposed: Canutson was chosen regent; but beginning to oppress the people, and aspiring openly to the crown, the Swedes and Danes revolted; in consequence of which a revolution took place, and Christopher duke of Bavaria, nephew to Eric, was chosen king of Denmark, Sweden, and Norway, in 1442.

17 Charles Canutson. An. 1448.

On the accession of the new prince, complaints against Canutson were brought from all quarters; but, through the interest of his friends, he escaped punishment; and in 1448, Christopher having died after a tyrannical reign of about five years, he was raised to the throne to which he had so long aspired. The kingdoms of Denmark and Norway however refused allegiance to him; on which a war immediately commenced. In 1454 peace was concluded, and Denmark for the present freed from the Swedish yoke. Nor did Canutson long enjoy even the crown of Sweden. Having quarrelled with the

Sweden.

magiſtrates and the archbiſhop of Upſal, the latter formed ſuch a ſtrong party that the king could not reſiſt him. Canutſon died in 1470 after a long and turbulent reign.

An. 1520.

The Swediſh affairs continued to be involved in dreadful confuſion till the year 1520, when a great revolution was effected by Guſtavus Ericſon, a nobleman of the firſt rank, who reſtored the kingdom to its liberty, and laid the foundation of its future grandeur. The occaſion of this great revolution was as follows: In 1518, Chriſtiern king of Denmark invaded Sweden, with a deſign to ſubdue the whole country; but being defeated with great loſs by young Steen Sture, at that time regent, he ſet ſail for Denmark. But meeting with contrary winds, he made ſeveral deſcents on the Swediſh coaſt, which he ravaged with all the fury of an incenſed barbarian. The inhabitants, however, bravely defended themſelves, and Chriſtiern was reduced to the utmoſt diſtreſs; one half of his forces having periſhed with hunger, and the reſt being in the moſt imminent danger by the approach of a rigorous winter. He then thought of a ſtratagem, which had almoſt proved fatal to the regent; for having invited him to a conference, at which he deſigned either to aſſaſſinate or take him priſoner, Sture was about to comply, had not the ſenate, who ſuſpected the plot, interpoſed and prevented him. Chriſtiern then offered to go in perſon to Stockholm in order to confer with Sture, on condition that ſix hoſtages ſhould be ſent in his room. This was accordingly done; but the wind happening then to prove favourable, he ſet ſail for Denmark with the hoſtages, of whom Guſtavus Ericſon was one. Next year he returned; and having drawn Sture into an ambuſh, the regent received a wound of which he died ſome time after. The kingdom being thus left without a head, matters ſoon came to the moſt deſperate criſis. The army diſbanded itſelf; and the ſenate, inſtead of taking proper meaſures to oppoſe the enemy, ſpent their time in idle debates. Chriſtiern in the mean time advanced into the heart of the kingdom, deſtroying every thing with fire and ſword; but on his arrival at Stragnez, he granted a ſuſpenſion of arms, on condition that they would elect him king. This they accordingly did; and Chriſtiern proved one of the moſt bloody tyrants that ever ſat on the throne of any kingdom. Immediately after his coronation, he gave grand entertainments for three days; during which time he projected the diabolical deſign of extirpating at once all the Swediſh nobility, and thus for ever preventing the people from revolting, by depriving them of their proper leaders. As the tyrant had ſigned articles, by which he promiſed indemnity to all who had borne arms againſt him, it became neceſſary to invent ſome cauſe of offence againſt thoſe whom he intended to deſtroy. To accompliſh his purpoſe, Guſtavus Trolle, formerly archbiſhop of Upſal, but who had been degraded from that dignity, in an oration before his majeſty lamented the demolition of Stecka, his place of reſidence, and the loſſes ſuſtained by the ſee of Upſal, amounting to near a million of money. He then proceeded in a bitter accuſation againſt the widow and the ſon-in-law of Sture the late regent, comprehending in the ſame accuſation about 15 of the principal nobility, the whole ſenate, and the burghers of Stockholm. In conſequence of this, about 60 of the principal nobility and people of firſt rank in Sweden were hanged as traitors. Innumerable other cruelties were committed; part of which are owned by the Daniſh hiſtorians, and minutely related by thoſe of Sweden. At laſt he departed for Denmark, ordering gibbets to be erected, and cauſing the peaſants to be hanged on them for the ſlighteſt offences.

18 Chriſtiern king of Denmark invades Sweden, but is defeated and driven out.

19 He treacherouſly carries off ſix hoſtages, of whom Guſtavus Ericſon is one. An. 1519.

20 Is choſen king, and proves a moſt bloody tyrant.

21 Maſſacres the nobility, and cauſes gibbets to be erected as he paſſes along.

This monſtrous cruelty, inſtead of ſecuring him on the throne, exaſperated the whole nation againſt him. It has already been mentioned, that Guſtavus Ericſon, or, as he is commonly called, *Guſtavus Vaſa*, was among the number of the hoſtages whom Chriſtiern had perfidiouſly carried to Denmark in 1519. Large promiſes had been made in order to reconcile him to Chriſtiern, and all means had been employed, but in vain. Secret orders were given to ſtrangle him in priſon; but the officer to whom the aſſaſſination was committed remonſtrated to the king about the conſequences of it, and prevailed on him to change the ſentence of death into cloſe confinement in the caſtle of Copenhagen. Some of the hoſtages periſhed in conſequence of the rigorous treatment they met with; but Guſtavus withſtood all hardſhips. At laſt one Banner, a Daniſh nobleman, prevailed on the king to put him into his hands, in order to try whether or not he could prevail on him to change his ſentiments. The king, however, told Banner, that he muſt pay 6000 crowns if the priſoner ſhould make his eſcape. Banner generouſly conſented; and having brought the noble priſoner to his fortreſs of Calo in Jutland, ſoon allowed him all the liberty he could deſire, and otherwiſe heaped favours on him. All this, however, could not extinguiſh his remembrance of the cruelties of Chriſtiern, and the deſire he had of being ſerviceable to his country. He therefore determined to make his eſcape; and the liberty he enjoyed ſoon put him in a capacity of effecting it. Having one day mounted his horſe, under pretence of hunting as uſual in the foreſt, when he got at a proper diſtance, he changed his dreſs to the habit of a peaſant: and quitting his horſe, travelled for two days on foot through by-paths, and over mountains almoſt impaſſable, arriving on the third at Flenſburgh. Here no one was admitted without a paſſport: and Guſtavus dreaded preſenting himſelf to the governor or the officer on guard, for fear of being diſcovered. Guſtavus hired himſelf to a cattle merchant; and in this diſguiſe eſcaped out of the Daniſh territories, and arrived at Lubec.

22 Adventures of Guſtavus Vaſa or Ericſon.

23 He eſcapes from Denmark.

24 Arrives at Lubec.

Banner was no ſooner acquainted with his eſcape, than he ſet out after him with the utmoſt diligence, found him at Lubec, and reproached him with great warmth as ungrateful and treacherous; but he was ſoon appeaſed by the arguments urged by Guſtavus, and eſpecially by a promiſe of indemnifying him in the loſs of his ranſom. On this Banner returned, giving out that he could not find his priſoner. Chriſtiern was enraged at his eſcape, apprehending that he might reverſe all his deſigns in Sweden; and gave orders to Otho his general to make the ſtricteſt ſearch, and leave no means untried to arreſt him. Guſtavus applied to the regency for a ſhip to convey him to Sweden, where he hoped he ſhould be able to form a party againſt the Danes. He likewiſe endeavoured to draw the regency of Lubec into his meaſures; and reaſoned with ſo much zeal and ability, that Nicholas Gemins, firſt conſul, was entirely gained; but the regency could never be prevailed on to declare for a party without friends, arms, money, or credit. Before his departure, however, the conſul gave him

25 He attempts in vain to draw the regency of Lubec over to his ſide.

Sweden.

him assurances, that if he could raise a force sufficient to make head against the enemy in the field, he might depend on the services of the republic, and that the regency would immediately declare for him. Gustavus desired to be landed at Stockholm; but the captain of the ship, either having secret orders to the contrary, or business elsewhere, steered a different course, and put him on shore near Calmar; a city then garrisoned by the troops of Christina widow of the regent. In fact, the governor held this place for his own purposes, and only waited to make the best terms he could with the Danes. When Gustavus arrived, he made himself known to him and the principal officers of the garrison, who were mostly Germans, and his fellow-soldiers in the late administrator's army; but the mercenary band, seeing him without troops and without attendants, regarded him as a desperate person devoted to destruction, refused to embrace his proposals, and even threatened to kill or betray him, if he did not instantly quit the city.

26 He arrives at Calmar, but meets with an unfavourable reception.

Disappointed in his expectations, Gustavus departed; and his arrival being now publicly known, he was again forced to have recourse to his peasant's disguise to conceal him from the Danish emissaries dispersed over the country to search for him. In a waggon loaded with hay he passed through the Danish army, and at last repaired to an old family castle in Sudermania. Hence he wrote to his friends, intimating his return to Sweden, and beseeching them to assemble all their forces in order to break through the enemy's army into Stockholm, at that time besieged; but they refused to embark in so hazardous and desperate an attempt.

27 His friends refuse to assist him.

Gustavus next applied himself to the peasants; but they answered, that they enjoyed salt and herrings under the government of the king of Denmark; and that any attempts to bring about a revolution would be attended with certain ruin, without the prospect of bettering their condition; for peasants they were, and peasants they should remain, whoever was king. At length, after several attempts to throw himself into Stockholm, after that city was surrendered to the king, after the horrid massacre of the senate, and after running a thousand dangers, and undergoing hardships and fatigues scarcely to be supported by human nature, he formed the resolution of trying the courage and affection of the Dalecarlians. While he was in the deepest obscurity, and plunged in almost insurmountable adversity, he never relinquished his designs nor his hopes. The news of the massacre had, however, nearly sunk him into despondency, as by it he lost all his friends, relations, and connections, and indeed almost every prospect of safety to himself or deliverance to his country. This suggested the thought of going to Dalecarlia, where he might live with more security in the high mountains and thick woods of that country, if he should fail in the attempt of exciting the inhabitants to revolt.

28 Applies in vain to the peasants.

Attended by a peasant, to whom he was known, he travelled in disguise through Sudermania, Nericia, and Westermania, and, after a laborious and painful journey, arrived in the mountains of Dalecarlia. Scarcely had he finished his journey, when he found himself deserted by his companion and guide, who carried off with him all the money which he had provided for his subsistence. Thus forlorn and destitute, he entered among the miners, without relinquishing his hopes of one day ascending the throne of Sweden. His whole object for the present was to live concealed, and gain a maintenance, till fortune should effect something in his favour: nor was it long before this happened. A woman in the mines perceived, under the habit of a peasant, that the collar of his shirt was embroidered. This circumstance excited curiosity; and the graces of his person and conversation, which had something in them to attract the notice of the meanest of the vulgar, afforded room for suspicion that he was some person of quality in disguise, forced by the tyranny of the government to seek shelter in these remote parts. The story came to the ears of a neighbouring gentleman, who immediately went to the mines to offer his protection to the unfortunate stranger; and was astonished on recognizing the features of Gustavus, to whom he had been known at the university of Upsal. Touched with compassion at the deplorable situation of so distinguished a nobleman, he could scarcely refrain from tears. At night he sent for Gustavus, made him an offer of his house, and gave him the strongest assurances of his friendship and protection. He told him, he would there meet with better accommodations, and as much security as in the mines; and that, should he chance o e discovered, he would, with all his friends and vassals, take arms in his defence.

29 Arrives in Dalecarlia, is robbed by his guide, and obliged to work in the mines.

30 Is discovered and relieved.

This offer was embraced by Gustavus with joy, and he remained for some time at his friend's house; but finding it impossible to induce him to take part in his designs, he quitted him, and fled to one Peterson, a gentleman whom he had formerly known in the service. This man received Gustavus with all the appearance of kindness; and, on the very first proposal, offered to raise his vassals. He even named the lords and peasants whom he pretended to have engaged in his service; but in a few days, he went secretly to a Danish officer, and gave him information of what had passed. The officer immediately caused the house to be surrounded with soldiers, in such a manner that it seemed impossible for Gustavus to escape. Being warned, by Peterson's wife of the treachery of her husband, he, by her direction, contrived to flee to the house of a clergyman, her friend, by whom he was received with all the respect due to his birth and merit; and lest the domestic who conducted him should follow the treacherous example of his master, he removed him to the church, and conducted him to a small closet, of which he kept the key. Having lived for some time in this manner, Gustavus began to consult with his friend concerning the most proper method of putting their schemes in execution. The priest advised him to apply directly to the peasants themselves; told him that it would be proper to spread a report, that the Danes were to enter Dalecarlia in order to establish new taxes by force of arms; and as the annual feast of all the neighbouring villages was to be held in a few days, he could not have a more favourable opportunity: he also promised to engage the principal persons of the diocese in his interest.

31 Has a very narrow escape from the Danes.

In compliance with this advice, Gustavus set out for Mora, where the feast was to be held. He found the peasants already informed of his designs, and impatient to see him. Being already prepossessed in his favour, they were soon excited to an enthusiasm in his cause, and

32 His cause espoused by the peasants of Dalecarlia.

Sweden.

and instantly resolved to throw off the Danish yoke. In this design they were more confirmed by their superstition; some of their old men having observed that the wind had blown from the north while Gustavus was speaking, which among them was reckoned an infallible omen of success. Gustavus did not allow their ardour to cool, but instantly led them against the governor's castle; which he took by assault, and put the garrison to the sword. This inconsiderable enterprise was attended with the most happy consequences. Great numbers of the peasants flocked to his standard; some of the gentry openly espoused his cause, and others supplied him with money. Christiern was soon informed of what had passed; but despising such an inconsiderable enemy, he sent only a slender detachment to assist his adherents in Dalecarlia. Gustavus advanced with 5000 men, and defeated a body of Danes; but he was strenuously opposed by the archbishop of Upsal, who raised numerous forces for Christiern. The fortune of Gustavus, however, still prevailed, and the archbishop was defeated with great loss. Gustavus then laid siege to Stockholm; but his force being unequal to such an undertaking, he was forced to abandon it with loss.

33 The Danes defeated.

This check did not prove in any considerable degree detrimental to the affairs of Gustavus; the peasants from all parts of the kingdom flocked to his camp, and he was joined by a reinforcement from Lubec. Christiern, unable to suppress the revolt, wreaked his vengeance on the mother and sisters of Gustavus, whom he put to death. His barbarities served only to make his enemies more resolute. Gustavus having assembled the states at Wadstena, he was unanimously chosen regent, the diet taking an oath of fidelity to him, and promising to assist him to the utmost. Having thus obtained the sanction of legal authority, he pursued his advantages against the Danes. A body of troops appointed to throw succours into Stockholm were cut in pieces; and the regent sending some troops into Finland, struck the Danes there with such terror, that the archbishop of Upsal, together with the Danish governors, fled to Denmark. Christiern then sent express orders to all his governors and officers in Finland and Sweden to massacre the Swedish gentry without distinction. The Swedes made reprisals by massacring all the Danes they could find; so that the whole country was filled with slaughter.

34 Horrid cruelty of King Christiern.

35 Success of Gustavus.

In the mean time Gustavus had laid siege to the towns of Calmar, Abo, and Stockholm; but Norby found means to oblige him to raise them with loss. Gustavus, in revenge, laid siege to the capital a third time, and applied to the regency of Lubec for a squadron of ships and other succours for carrying on the siege. This was granted on condition that Gustavus should oblige himself, in the name of the states, to pay 60,000 merks of silver as the expence of the armament; that, until the kingdom should be in a condition to pay that sum, the Lubec merchants trading to Sweden should be exempted from all duties on imports or exports; that all other nations should be prohibited from trading with Sweden, and that such traffic should be deemed illicit; that Gustavus should neither conclude a peace, nor even agree to a truce, with Denmark, without the concurrence of the regency of Lubec; and that if the republic should be attacked by Christiern, he should enter Denmark at the head of 20,000 men. On these hard terms Gustavus obtained assistance from the regency of Lubec; nor did his dear-bought allies prove very faithful. They did not indeed go over to the enemy; but in a sea-fight, where the Danes were entirely in the power of their enemies, they suffered them to escape, when their whole force might have been entirely destroyed. This treachery had nearly ruined the affairs of Gustavus; for Norby was now making preparations effectually to relieve Stockholm; in which he would probably have succeeded: but at this critical period news arrived that the Danes had unanimously revolted, and driven Christiern from the throne; and that the king had retired into Germany, in hopes of being restored by the arms of his brother-in-law the emperor. On hearing this news, Norby retired with his whole fleet to the island of Gothland, leaving but a slender garrison in Calmar. Gustavus did not fail to improve this opportunity to his own advantage, and quickly made himself master of Calmar. Mean time Stockholm continued closely invested; but Gustavus thought proper to protract the siege till he should get himself elected king. Having for this purpose called a general diet, he first filled up the vacancy in the senate occasioned by the massacres of Christiern. Gustavus had the address to get such nominated as were in his interest. The assembly was no sooner met, than a speech was made, containing the highest encomiums on Gustavus, setting forth in the strongest light the many eminent services he had done for his country, and concluded that the states would show themselves equally ungrateful and blind to their own interest if they did not immediately elect him king. This proposal was acceded to by such tumultuous acclamations that it was impossible to collect the votes; so that Gustavus himself acknowledged, that their affection exceed his merit, and was more agreeable to him than the effects of their gratitude. He was urged to have the ceremony of his coronation immediately performed: but this he delayed, in consequence of some designs which he had formed to reduce the exorbitant power of the clergy. Gustavus had himself embraced the doctrines of the reformed religion, and did all in his power to establish the reformation in his new kingdom. His design could not fail to raise against him the enmity of the clergy, and of all the more superstitious part of his subjects. Accordingly, the first years of his reign were embittered by internal disturbances and revolts, which were aided and fomented by the deposed Christiern, who was at one time very near regaining possession of the Swedish dominions.

36 He is chosen king of Sweden. An. 1523.

Christiern having established a powerful interest in Norway, once more made an attempt to recover his kingdoms, and was joined by the Dalecarlians; but being defeated by the Swedish forces, he was forced to return to Norway, where, being obliged to capitulate with the Danish generals, he was kept prisoner all his life.

37 Unsuccessful attempt of Christiern.

In 1542, Gustavus having happily extricated himself out of all his troubles, prevailed on the states to make the crown hereditary in his family; after which he applied himself to the encouragement of learning and commerce. A treaty was set on foot for a marriage between his eldest son Eric and Elizabeth queen of England; but this negociation failed of success.

38 Unsuccessful negotiation for a marriage with Queen Elizabeth. An. 1542.

Gustavus Vasa died in 1560, and was succeeded by his

Sweden.

his ſon Eric XIV. The new king was poſſeſſed of all the exterior ornaments which give an air of dignity to the perſon; but he had neither the prudence nor the penetration of his father. He created the firſt nobility that were ever known in Sweden; but this he had no ſooner done than he quarrelled with them, by paſſing ſome act, which they thought derogatory to their honour and dignity. The whole courſe of his reign was diſturbed by wars with Denmark, and diſputes with his own ſubjects. In the former he was unfortunate, and towards the latter he behaved with the greateſt cruelty. At laſt, he is ſaid to have become mad. He afterwards recovered his ſenſes, but was ſoon dethroned by his brothers; of whom Duke John ſucceeded him in the kingdom.

39 Guſtavus dies, and is ſucceeded by Eric, a weak and imprudent prince. An. 1560.

40 Eric depoſed, and ſucceeded by his brother John.

This revolution took place in the year 1568, but with no great advantage to Sweden. Diſputes about religion between the king and his brothers, and wars with Ruſſia, threw matters into the utmoſt confuſion. At laſt Prince Sigiſmund, the king's ſon, was choſen king of Poland, which proved the ſource of much trouble to the kingdom. In 1590 King John died; and as Sigiſmund was at a diſtance, every thing fell into the utmoſt confuſion: the treaſury was plundered, and the royal wardrobe quite ſpoiled, before even Duke Charles could come to Stockholm to take on himſelf the adminiſtration until King Sigiſmund ſhould return. This, however, was far from being the greateſt diſaſter which befel the nation at this time. It was known that the king had embraced the Popiſh religion, and it was with good reaſon ſuſpected that he would attempt to reſtore it upon his arrival in Sweden. Sigiſmund was alſo obliged, on leaving Poland, to promiſe that he would ſtay no longer in Sweden than was neceſſary to regulate his affairs. Theſe circumſtances ſerved to alienate the minds of the Swedes from their ſovereign even before they ſaw him; and the univerſal diſſatisfaction was increaſed, by ſeeing him attended, on his arrival in Sweden in 1593, by the pope's nuncio, to whom he made a preſent of 30,000 ducats to defray the expences of his journey to Sweden.

41 Prince Sigiſmund choſen king of Poland. An. 1568.

42 Succeeds to the crown of Sweden. An. 1590.

What the people had foreſeen was too well verified: the king refuſed to confirm the Proteſtants in their religious privileges, and ſhowed ſuch partiality on all occaſions to the Papiſts, that a party was formed againſt him; at the head of which was Duke Charles his uncle. Remonſtrances, accompanied with threats, took place on both ſides. Sigiſmund was apparently reconciled to his brother, and promiſed to comply with the inclinations of the people, though without any inclination to perform what he had promiſed. The agreement, indeed, was ſcarcely made, before Sigiſmund conceived the horrid deſign of murdering his uncle at the Italian comedy acted the night after his coronation. The duke, however, having notice of the plot, found means to avoid it. This enraged the king ſo much, that he had reſolved to accompliſh his deſigns by force; and therefore commanded a Poliſh army to march towards the frontiers of Sweden, where they committed all the ravages that could be expected from an enraged and cruel enemy. Complaints were made by the Proteſtant clergy to the ſenate: but no other reply was made them, than that they ſhould abſtain from thoſe bitter invectives and reproaches, which had provoked the Catholics, till the king's departure; at which time they would be at more liberty.

43 A party formed againſt him.

44 Forms a deſign of murdering his uncle.

In 1595 Sigiſmund ſet ſail for Dantzic, leaving the adminiſtration in the hands of Duke Charles. The conſequence of this was, that the diſſenſions which had already taken place being continually increaſed by the obſtinacy of the king, Duke Charles aſſumed the ſovereign power; and in 1604 Sigiſmund was formally depoſed, and his uncle Charles IX. raiſed to the throne. He proved a wiſe and brave prince, reſtoring the tranquillity of the kingdom, and carrying on a war with vigour againſt Poland and Denmark. He died in 1611, leaving the kingdom to his ſon, the celebrated Guſtavus Adolphus.

45 Sigiſmund depoſed, and is ſucceeded by Charles IX. An. 1604.

Though Charles IX. by his wiſe and vigorous conduct had in a great meaſure retrieved the affairs of Sweden, they were ſtill in a very bad ſituation. The finances of the kingdom were entirely drained by a ſeries of wars and revolutions; powerful armies were preparing in Denmark, Poland, and Ruſſia, while not only the Swediſh troops were inferior in number to their enemies, but the government was deſtitute of reſources for their payment.

46 State of Sweden on the acceſſion of Guſtavus Adolphus. An. 1611.

Though the Swediſh laws required that the prince ſhould have attained his 18th year before he was of age, yet ſuch ſtriking marks of the great qualities of Guſtavus appeared, that he was allowed by the ſtates to take on him the adminiſtration even before this early period. His firſt act was to reſume all the crown-grants, that he might be the better able to carry on the wars in which he was engaged; and to fill all places, both civil and miltary, with perſons of merit. At the head of domeſtic and foreign affairs was placed Chancellor Oxenſtiern, a perſon every way equal to the important truſt, and the chooſing of whom impreſſed Europe with the higheſt opinion of the young monarch's penetration and capacity.

47 He is allowed to aſſume the adminiſtration while yet a minor.

Soon after his acceſſion, Guſtavus received an embaſſy from James I. of Britain, exhorting him to make peace with his neighbours. This was ſeconded by another from Holland. But as the king perceived that the Daniſh monarch intended to take every opportunity of cruſhing him, he reſolved to act with ſuch vigour, as might convince him that he was not eaſily to be overcome. Accordingly he invaded Denmark with three different armies at once; and though the enemy's ſuperiority at ſea gave them great advantages, and the number of the king's enemies diſtracted his attention, he carried on the war with ſuch ſpirit, that in 1613 a peace was concluded on good terms. This war being finiſhed, the king applied himſelf to civil polity, and made ſome reformation in the laws of Sweden. In 1615, hoſtilities were commenced againſt Ruſſia, on account of the refuſal of that court to reſtore ſome money which had been formerly lent them. The king entered Ingria, took Kexholm by ſtorm, and was laying ſiege to Pleſcov, when, by the mediation of James I. peace was concluded, on condition of the Ruſſians repaying the money, and yielding to Sweden ſome part of their territory. In this and the former war, notwithſtanding the ſhortneſs of their duration, Guſtavus learned the rudiments of the military art for which he ſoon became ſo famous. He is ſaid, indeed, to have taken every opportunity of improvement with a quickneſs of underſtanding ſeemingly more than human. In one campaign, he not only learned, but improved, all the military maxims of La Gardie, a celebrated general, brought the Swediſh army to a more ſteady and regular diſcipline, and formed an invincible

48 He invades Denmark, and obliges the king to conclude a peace.

49 Ruſſia invaded with ſucceſs.

50 Extraordinary military genius of the king.

Sweden.

invincible body of Finlanders, who had afterwards a very considerable share in the victories of Sweden.

Peace was no sooner concluded with Russia, than Gustavus was crowned with great solemnity at Upsal. Soon after this he ordered his general La Gardie to acquaint the Polish commander Codekowitz, that as the truce between the two kingdoms, which had been concluded for two years, was now expired, he desired to be certainly informed whether he was to expect peace or war from his master. In the mean time, having borrowed money of the Dutch for the redemption of a town from Denmark, he had an interview on the frontiers with Christiern the king of that country. At this interview, the two monarchs conceived the utmost esteem and friendship for each other; and Gustavus obtained a promise, that Christiern would not assist Sigismund in any design he might have against Sweden. In the mean time, receiving no satisfactory answer from Poland, Gustavus began to prepare for war. Sigismund entered into a negociation, and made some pretended concessions, with a view to seize Gustavus by treachery; but the latter having intimation of his design, the whole negociation was changed into reproaches and threats on the part of Gustavus.

51 Has a friendly interview with the king of Denmark, and prepares for war with Poland.

Immediately after this, Gustavus made a tour in disguise through Germany, and married Eleonora the daughter of the elector of Brandenburg. He then resolved to enter heartily into a war with Poland; and with this view set sail for Riga with a great fleet, which carried 20,000 men. The place was well fortified, and defended by a body of veterans enthusiastically attached to Sigismund; but after a vigorous siege, the garrison being reduced to extremity, were obliged to capitulate, and were treated with great clemency.

52 Marries Eleonora, daughter of the elector of Brandenburg.

53 Riga besieged and taken.

After the reduction of Riga, the Swedish monarch entered Courland, where he reduced Mittau; but ceded it again on the conclusion of a truce for one year. Sigismund, however, no sooner had time to recover himself, than he began to form new enterprises against the Swedes in Prussia; but Gustavus setting sail with his whole fleet for Dantzic, where the king of Poland then resided, so defeated his measures, that he was obliged to prolong the truce for another year. Sigismund, however, was not yet apprised of his danger, and refused to listen to any terms of accommodation: on which Gustavus entering Livonia, defeated the Polish general, and took Derpt, Hockenhausen, and several other places of less importance; after which, entering Lithuania, he took the city of Birsen.

54 The Poles defeated, and several places taken.

Notwithstanding this success, Gustavus proposed peace on the same equitable terms as before; but Sigismund was still infatuated with the hopes that, by means of the emperor of Germany, he should be able to conquer Sweden. Gustavus finding him inflexible, resolved to push his good fortune. His generals Horn and Thurn defeated the Poles in Semigallia. Gustavus himself with 150 ships set sail for Prussia, where he landed at Pillaw. This place was immediately delivered up to him; as were several other places. Sigismund, alarmed at the great progress of Gustavus, sent a body of forces to oppose him, and to prevent Dantzic from falling into his hands. In this he was attended with as little success as before; and in May 1627, Gustavus arrived with fresh forces before Dantzic, which he would probably have carried, had he not been wounded in the belly by a cannon-shot. The States of Holland sent ambassadors to mediate a peace between the two crowns; but Sigismund, depending on the assistance of the emperor of Germany and king of Spain, determined to hearken to no terms, and resolved to make a winter campaign. Gustavus, however, was so well intrenched, and all his forts were so strongly garrisoned, that the utmost efforts of the Poles were to no purpose. The city of Dantzic in the mean time made such a desperate resistance as greatly irritated Gustavus. In a sea engagement the Swedish fleet defeated that of the enemy; after which Gustavus, having blocked up the harbour with his fleet, pushed his advances on the land side with incredible vigour. He made a surprising march over a morass 15 miles broad, assisted by bridges of a peculiar construction, over which he carried a species of light cannon invented by himself. By this unexpected manœuvre he got the command of the city in such a manner, that the garrison were on the point of surrendering, when, by a sudden swell of the Vistula, the Swedish works were ruined, and the king was obliged to raise the siege. In other respects, however, the affairs of Gustavus went on with their usual good fortune. His general Wrangel defeated the Poles before Brodnitz. At Stum the king gained another and more considerable victory in person. The emperor had sent 5000 foot and 2000 horse under Arnheim, who joined the main army commanded by the Polish general Coniecspolski, in order to attack the Swedish army encamped at Quidzin. The enemy were so much superior in number, that the friends of Gustavus warmly dissuaded him from attacking them. But the king being determined, the engagement began. The Swedish cavalry charged with such impetuosity, contrary to their sovereign's express order, that they were almost surrounded by the enemy; but Gustavus, coming up to their assistance, pushed the enemy's infantry with so much vigour, that they gave way, and retreated to a bridge that had been thrown over the Werder. But here they were disappointed; for the Swedes had already taken possession of the bridge. On this a new action ensued more bloody than the former, in which the king was exposed to great danger, and thrice narrowly escaped being taken prisoner; but at last the Poles were totally defeated, with immense loss. The slaughter of the German auxiliaries was so great, that Arnheim scarcely carried off one half of the troops which he brought into the field. This defeat did not hinder the Polish general from attempting the siege of Stum; but here again he was attended by his usual bad fortune. Arnheim was recalled, and succeeded by Henry of Saxe Lawenburg and Philip Count Mansfeldt. The change of general officers, however, produced no good consequences to the Poles; a famine and plague raged in their camp, so that they were at last obliged to consent to a truce for six years, to expire in the month of June 1635. Gustavus kept the port and citadel of Memel, the harbour of Pillau, the town of Elbing, Brunsberg, and all that he had conquered in Livonia.

55 The Poles again defeated, and a great number of towns reduced by Gustavus.

Sweden.

56 The Poles defeated a third time. An. 1627.

57 The Poles defeated by sea, and Dantzic invested.

58 The king obliged by an inundation of the Vistula to raise the siege.

59 The Poles and Germans defeated with great slaughter in two engagements.

60 They are again defeated, and obliged to consent to a truce of six years.

Gustavus having thus brought the war with Poland to an honourable conclusion, began to think of resenting the conduct of the emperor in assisting his enemies and oppressing the Protestant states. Before embarking in such an important undertaking, it was necessary that he should consult the diet. In this the propriety of engaging

61 Gustavus resolves on a war with the emperor.

Sweden.

ging in a war with Germany was warmly debated; but, after much altercation, Guſtavus in a very noble ſpeech determined the matter, and ſet forth in ſuch ſtrong terms the virtuous motives by which he was actuated, that the whole aſſembly wept, and every thing was granted which he could require.

It was not difficult for Guſtavus to begin his expedition. His troops amounted to 60,000 men, hardened by a ſucceſſion of ſevere campaigns in Ruſſia, Finland, Livonia, and Pruſſia. His fleet exceeded 70 ſail, carrying from 20 to 40 guns, and manned with 6000 ſeamen. Embarking his troops, he landed at Uſedom on the 24th of June 1630, the Imperialiſts having evacuated all the fortreſſes which they poſſeſſed there; and the iſle of Rugen had been before reduced by General Leſly, in order to ſecure a retreat if fortune ſhould prove unfavourable. Paſſing the frith, Guſtavus ſtormed Wolgaſt and another ſtrong fortreſs in the neighbourhood, leaving a garriſon for the defence of theſe conqueſts. He then proceeded to Stetin; which conſented to receive a Swediſh garriſon, and the king perſuaded the duke of Pomerania to enter into an alliance with him. In conſequence of this the Swediſh troops were received into ſeveral towns of Pomerania; and the moſt bitter enmity took place between the Imperialiſts and Pomeranians.

62 Reduces Wolgaſt, Stetin, &c. An. 1630.

Theſe ſucceſſes of Guſtavus ſtruck the empire with conſternation; for being already overwhelmed with civil diſſenſions, they were in no condition to reſiſt ſo impetuous an enemy. At laſt Count Tilly was inveſted with the dignity of veldt mariſchal. In the mean time the king being reinforced by a conſiderable body of troops in Finland and Livonia under the conduct of Guſtavus Horn, defeated the Imperialiſts before Griffenhagen; taking the place ſoon after by aſſault. By this and ſome other conqueſts he opened a paſſage into Luſatia and Sileſia; but in the mean time Count Tilly cut off 2000 Swedes at New Brandenburg. This advantage, however, was ſoon overbalanced by the conqueſt of Franckfort on the Oder, which Guſtavus took by aſſault, making the whole garriſon priſoners. Thus he commanded the rivers Elbe and Oder on both ſides, and had a fair paſſage not only to the countries already mentioned, but alſo to Saxony and the hereditary dominions of the houſe of Auſtria. Soon after this, Guſtavus laid ſiege to Landſberg, which he took by aſſault.

63 Count Tilly choſen general by the emperor.

64 Cuts off 2000 Swedes.

65 Franckfort and Landſberg taken by Guſtavus.

About this time the Proteſtant princes held a diet at Leipſic; to which Guſtavus ſent deputies, and conducted his negociations with ſuch addreſs, as tended greatly to promote his intereſts. Immediately after this he reduced Gripſwald, and with it all Pomerania. Then marching to Guſtrow, he reſtored the dukes of Mecklenburg to their dominions.

66 He reduces Pomerania, and reſtores the dukes of Mecklenburg.

All this time Count Tilly was employed in the ſiege of Magdeburg; but now, being alarmed at the repeated ſucceſſes of the Swedes, he left Pappenheim with part of the army before that city, while he marched with the reſt into Thuringia, to attack the landgrave of Heſſe-Caſſel and the elector of Saxony. After a moſt obſtinate defence, Magdeburg fell into the hands of Pappenheim, who committed there all imaginable cruelties. Guſtavus formed a plan of recovering the city; but was obliged to abandon it, by Pappenheim's throwing himſelf into the place with his whole army, and by the progreſs which Tilly was making in Thuringia. Relinquiſhing this enterpriſe, therefore, he ordered an attack on Havelſburg; which was done with ſuch reſolution, that the place was forced in a few hours, and all the garriſon made priſoners. Werben was next obliged to ſubmit after an obſtinate conflict, in which many fell on both ſides.—Theſe ſucceſſes obliged Count Tilly to attempt in perſon to check the progreſs of the Swedes. He detached the vanguard of his army, compoſed of the flower of the Imperial cavalry, within a few miles of the Swediſh camp. An action enſued, in which Bernſtein the Imperial general was defeated and killed, with 1500 of his men. Guſtavus, after this advantage, placed himſelf in a ſituation ſo much ſuperior to his enemies, that Count Tilly was fired with indignation, and marched up to the Swediſh lines to give him battle. Guſtavus kept within his works, and Tilly attacked his camp, though almoſt impregnably fortified, keeping up a moſt terrible fire from a battery of 32 pieces of cannon; which, however, produced no other effect, than obliging the Swediſh monarch to draw up his army behind the walls of Werben. Tilly had placed his chief hopes in being able to ſpike the enemy's cannon, or ſet fire to their camp; after which he propoſed making his grand attack. With this view he bribed ſome priſoners; but they betrayed him, and told his deſign to Guſtavus. The king ordered fires to be lighted in different parts of his camp, and his ſoldiers to imitate the noiſe of a tumultuous diſorderly rabble. This had the deſired effect. The count led his army to the breach made by the cannon; where he was received with ſuch a volley of grape ſhot as cut off the firſt line, and put the whole body in diſorder, ſo that they could never be brought back to the charge. In this confuſion the Imperial army was attacked, and, after an obſtinate conflict, obliged to quit the field.

Sweden.

68 Havelſburg and Werben reduced, and the cavalry of the Imperialiſts defeated by the Swedes.

69 Count Tilly defeated by Guſtavus.

Soon after this action the queen arrived at the camp with a reinforcement of 8000 men; at the ſame time a treaty was concluded with Charles I. of England, by which that monarch allowed the marquis of Hamilton to raiſe 6000 men for the ſervice of Guſtavus. Theſe auxiliaries were to be conducted to the main army by a body of 4000 Swedes; and were in every thing to obey the king while he was perſonally preſent, but in his abſence were to be ſubject to the orders of the marquis. With theſe troops the king had reſolved to make a diverſion in Bremen: but the marquis finding it impoſſible to effect a junction with the Swediſh army, reſolved, without debarking his troops, to ſteer his courſe for the Oder, and land at Uſedom. Guſtavus was very much diſpleaſed at finding his project thus diſconcerted; but, making the beſt of the preſent circumſtances, he commanded the Britiſh troops to act on the Oder inſtead of the Weſer. The number of this little army was magnified exceedingly by report, inſomuch that Count Tilly had ſome thoughts of marching againſt them with his whole force; but on the departure of the marquis for Sileſia, he reinforced the army in that country with a large detachment, which was thought to contribute not a little to the defeat he ſoon after received.

70 A body of Britiſh ſoldiers comes to the aſſiſtance of the Swedes.

Since the late action Guſtavus had kept within his intrenchments, where his army was well provided with every thing. Tilly made ſeveral attempts to ſurpriſe or draw him to an engagement; but finding all his endeavours fruitleſs, he marched into Saxony, and laid ſiege

to

67 Magdeburg taken by the Imperialiſts, and the inhabitants cruelly uſed.

Sweden.

to Leipfic. This precipitate meafure proved highly advantageous to the Swedifh monarch. A treaty offenfive and defenfive was immediately concluded with Guftavus: and the elector willingly promifed every thing that was required of him. Tilly, in the mean time, carried fire and fword into the electorate. At the head of an army of 44,000 veterans, he fummoned the city of Leipfic to furrender; denouncing the fame vengeance againft it as had been executed on Magdeburg, in cafe of a refufal. By this the governor was fo much intimidated, that he inftantly fubmitted; and alfo furrendered the caftle of Paffenberg, which was in a condition to have ftood out till the arrival of the Swedifh army. The elector, enraged at the lofs of thefe valuable places, ordered his army to join the Swedes with all expedition, and preffed the king fo warmly to engage, that at laft he yielded to his defire. On the 7th of September 1631, Guftavus led out his army in the fineft order, the Swedes forming one column on the right, and the Saxons another on the left; each amounting to 15,000 men. Tilly drew up his men in one vaft column, probably with a view of furrounding the flanks of the king's army. Guftavus led on his troops againft that wing of the Imperialifts commanded by Pappenheim, whom he drove back to a confiderable diftance. General Bannier in the mean time cut in pieces the troops of Holftein, and mortally wounded the duke who commanded them. Pappenheim led on his troops feven times to the charge, but was as often repulfed by the Swedes. Tilly all this while was engaged with the Saxons; but having at laft driven them off the field, the whole ftrength of the Imperial army was turned againft the Swedifh left wing. The Swedes fuftained the attack with the greateft firmnefs, until the king detached the centre to affift them. The Imperialifts then were no longer able to ftand their ground; but gave way everywhere except in the centre, which was compofed of 18 regiments of veterans accuftomed to victory, and deemed invincible. They made incredible efforts to maintain their reputation; and, though fwept off in great numbers by the Swedifh artillery, never fhrunk or fell into confufion. Four regiments, after their officers had been killed, formed themfelves, and retired to the fkirt of a wood. Tilly retired at the head of 600 men, and efcaped by the coming on of the night. Seven thoufand Imperialifts lay dead on the field of battle; 4000 were taken prifoners; a fine train of artillery was loft, with upwards of 100 ftandards, enfigns, and other military trophies.

71 Saxony ravaged by Count Tilly, who takes Leipfic.

72 Battle of Leipfic. An. 1631.

73 The Imperialifts defeated with great flaughter.

74 Conduct of Guftavus cenfured.

Guftavus now determined to penetrate into Franconia, where he reduced feveral places. efpecially the fortrefs of Workburg. Tilly having collected his fcattered troops, which formed an army ftill fuperior in number to that of Guftavus, marched to the relief of this place; but came too late. He then directed his march towards Rottenberg, where four regiments were cut in pieces by a Swedifh detachment. After this the king reduced Hanau, Franckfort on the Maine, and Mentz; deftroying a body of Spaniards, who had attempted to obftruct his paffage.

75 The Swedes take a number of towns, and cut off four regiments of the enemy.

The court of Vienna was now thrown into the utmoft confufion; and fent everywhere begging affiftance, and foliciting the Catholic princes to arm in defence of their religion. The emperor was moft embarraffed in finding out a general capable of oppofing Guftavus in the field; for the late misfortunes of Count Tilly had entirely funk his reputation. Walleftein, an old experienced officer, was felected; but as he had formerly been difgraced, it was apprehended that he would not accept of the command of which he had once been deprived. This objection, however, was got over; and Walleftein not only accepted of the command, but, at his own expence, augmented the army to 40,000 men.

76 Walleftein chofen general by the emperor.

During the whole winter the Swedifh army kept the field; and before the approach of fummer had reduced a great number of places, while the landgrave William made great progrefs in Weftphalia. Guftavus Horn was repulfed before Bamberg; but foon had his revenge, by entirely deftroying two regiments of imperialifts. To prevent the troops from being affected by the lofs before Bamberg, the king refolved to give battle to Tilly, who was marching into Bavaria to prevent the Swedes from gaining a footing in that electorate. He purfued the Imperial general through a vaft tract of country, defeated his rear-guard, and, having reduced a variety of towns and fortreffes on the Danube, penetrated as far as Ulm. Advancing to the river Leck, Count Tilly poffted himfelf in a wood on the oppofite fide, to difpute his paffage. Guftavus endeavoured to diflodge him by a regular fire from 70 pieces of cannon. The flaughter was dreadful; and Tilly himfelf, being wounded by a cannon-ball in the knee, died a few days before he was to have been fuperfeded by Walleftein. The following night the Imperial army evacuated the poft. Guftavus immediately croffed the river, and feized the towns of Rain and Newburg, which the enemy had abandoned, and Augfburg next fubmitted.

77 A great number of towns taken by the Swedes.

78 Count Tilly defeated and killed.

From Augfburg the Swedes advanced towards Ratifbon; but were difappointed in their defign of getting poffeffion of that city, as the Bavarians had thrown a numerous garrifon into the place.—In the mean time, ambaffadors arrived from Denmark, offering the mediation of that crown for obtaining a lafting peace between the contending parties. This negociation, however, failed of fuccefs, as the ambaffadors had not been inftructed to offer terms favourable to the Proteftants. Guftavus now, refolving to retort on themfelves the cruelties which the Bavarians had inflicted on the Proteftants, laid the towns of Morzbourg, Friefengen, and Landfhut, in afhes. The inhabitants of Munich faved themfelves by fubmiffion; Guftavus alfo defeated the forces of the elector, who had been joined by a confiderable body of militia.

79 Three towns laid in afhes by the Swedes.

While Guftavus was thus employed, Walleftein had affembled a vaft army. He was ftrongly folicited by the elector of Bavaria to come to his affiftance; but, in revenge of the elector's having formerly obtained the command for Count Tilly in preference to himfelf, he drew off towards Bohemia to encounter the Saxons. Arnheim, who commanded the Saxon forces in that place, was an enemy to Guftavus, who had formerly rallied him for his cowardice. He therefore permitted Walleftein to gain an eafy victory, in hopes that his mafter, the elector of Saxony, a prince entirely devoted to his pleafures, might be induced to relinquifh the friendfhip of fuch a reftlefs and warlike ally as Guftavus; and indeed he ufed all the eloquence of which he was mafter to detach him from the Swedifh caufe. Several advantages, in the mean time, were gained by the Imperialifts. Pappenheim defeated the archbifhop of Bremen's cavalry at Werden; and three Swedifh regiments were

80 The Saxon troops defeated by Walleftein.

Sweden.

were cut off near Kadingen. Pappenheim, however, was forced to retire, and withdraw his forces from Stade; of which the Swedes took poſſeſſion. Walleſtein and the elector of Bavaria, who had now joined their forces, threatened Guſtavus with greatly ſuperior numbers. At laſt, however, the king, being reinforced with 15,000 men, no longer declined the engagement; but Walleſtein was too wiſe to truſt the fate of the empire to a ſingle battle againſt ſuch an enemy as the king of Sweden. Guſtavus attacked his camp, but was repulſed with the loſs of 2000 men. Several other misfortunes happened to the Swedes; and at laſt, after various manœuvres, Walleſtein bent his courſe towards Miſnia, in order to oblige the elector of Saxony to declare againſt the Swedes, and to draw them out of Bavaria, Guſtavus, notwithſtanding the inconſtancy of Auguſtus, immediately ſet out to aſſiſt him. With incredible diligence he marched to Miſnia, where the Imperialiſts were aſſembling their whole ſtrength. Hearing that the enemy were encamped at Weſenfells, and that Pappenheim had been detached with a ſtrong corps, Guſtavus reſolved to engage them before they could effect a junction. With this view he marched to Lutzen, where he attacked Walleſtein with incredible fury. The Swediſh infantry broke the Imperialiſts in ſpite of their utmoſt efforts, and took all their artillery. The cavalry not being able to paſs the river ſo expeditiouſly as the king thought neceſſary, he led the way, attended only by a ſingle regiment and the duke of Saxe-Lauwenburg. Here, after charging impetuouſly, he was killed. The news of his death was in an inſtant ſpread over both armies. The courage of the Imperialiſts revived, and they now made themſelves ſure of victory. But the Swedes, eager to revenge the death of their beloved monarch, charged with ſuch fury that nothing could reſiſt them. The Imperialiſts were defeated a ſecond time, juſt as Pappenheim, with his freſh corps, came up to their aſſiſtance. On this the battle was renewed, but the Swedes were ſtill irreſiſtible. Pappenheim was mortally wounded, and his army finally routed, with the loſs of 9000 killed in the field and in the purſuit.

81 Guſtavus attacks his camp, and is repulſed with loſs.

82 Battle of Lutzen.

83 Guſtavus killed.

84 The Imperialiſts totally defeated.

85 Chriſtina, an infant, proclaimed queen of Sweden.

This victory proved more unfortunate to Sweden than the greateſt defeat. The crown devolved on Chriſtina the daughter of Guſtavus, an infant of ſix years old; the nation was engaged in an expenſive foreign war, without any perſon equal to the arduous taſk of commanding the armies, or regulating domeſtic affairs, as Guſtavus had done. Chriſtina was immediately proclaimed queen. The regency devolved on the grand bailiff, the mariſchal, the high admiral, the chancellor, and the treaſurer of the crown. Oxenſtiern was inveſted with the chief management of affairs, and conducted himſelf with the greateſt prudence. The reign and character of Chriſtina have been fully detailed under the article CHRISTINA, to which we may refer our readers.

86 Charles Guſtavus appointed heir to the crown of Sweden.

From the treaty of Weſtphalia, Sweden enjoyed ſome years of repoſe. Charles Guſtavus, Count Palatine, having gained the favour of Chriſtina, was appointed generaliſſimo of the forces, and heir-apparent to the crown. A marriage was propoſed between them; but the queen would never liſten to this or any other propoſal of the kind. In 1650, the ceremony of the queen's coronation was performed; but in four years after, ſhe reſigned the crown in favour of Guſtavus. (See the article CHRISTINA).

An. 1654.

The new king found himſelf involved in conſiderable difficulties on his acceſſion to the throne. The treaſury was quite exhauſted; great part of the revenue was appointed for the ſupport of Chriſtina's houſehold; the people were oppreſſed with taxes; and the nation having been diſarmed for ſeveral years, began to loſe its reputation among foreigners. To remedy theſe evils, Charles propoſed to reſume all the crown-lands which had been alienated by grants to favourites during the late reign; to repeal a duty which had been laid on ſalt; to put the kingdom in a poſture of defence; and to enter on a war with ſome neighbouring ſtate. Under a pretence that Caſimir king of Poland had queſtioned his title to the throne, he prepared to invade that kingdom. Several embaſſies were ſent from Poland to Stockholm; but ſome point of ceremony always diſappointed them of an audience of the king; ſo that they were obliged to return without their errand. As ſoon as matters were in readineſs, General Wittemberg made an irruption into Poland from the ſide of Pomerania. The Poles oppoſed him with an army of 15,000 men; but inſtead of fighting, they began to negociate, and in a ſhort time entirely diſperſed. Charles himſelf ſoon followed with a powerful army, and purſued his march without obſtruction, all the cities throwing open their gates to him as he approached. As he advanced to Cracow, Caſimir reſolved to make one effort to ſave his capital. His army amounted only to 10,000 men; and theſe were unfortunately ſuch as had never ſtood fire. After a feeble reſiſtance, they fled with precipitation, having loſt 1000 men killed and taken priſoners. A few days after this Charles defeated the Poles a ſecond time, about eight leagues from Cracow; on which Caſimir fled with his family to Oppelen in Sileſia. The capital was then inveſted; and though defended with the utmoſt valour, was in a ſhort time obliged to capitulate. Thus in leſs than three months Charles apparently became maſter of Poland; but it was ſoon evident that the Poles had no intention of abandoning their former ſovereign.

87 State of Sweden on the acceſſion of Charles X.

88 War with Poland reſolved on.

89 The Poles defeated, and the kingdom reduced.

In 1656 a war took place with the elector of Brandenburg. While Charles was employed in the conqueſt of Poland, that prince had invaded Royal and Ducal Pruſſia, and reduced the moſt conſiderable towns with little oppoſition. The king of Sweden took umbrage at his progreſs; and having marched againſt him, defeated his forces in ſeveral ſlight encounters, and obliged him to acknowledge himſelf a vaſſal of Sweden. Theſe rapid conqueſts alarmed all Europe; and the different powers ſought for means of driving the Swedes out of Poland, which they had ſo unexpectedly and unjuſtly ſeized. The Poles were no ſooner aſſured that they ſhould be aſſiſted, than they everywhere revolted and maſſacred the Swedes. Caſimir returned from Sileſia; and thoſe very troops and generals who had before ſubmitted to Charles without oppoſition, now ranged themſelves under the banners of his antagoniſt. Charles immediately marched from Pruſſia to chaſtiſe the inſolence of the Poles, and totally defeated a body of 12,000 men. This did not hinder all the Poles incorporated with his troops to deſert; which conſiderably reduced his army; and the campaign being performed in the depth of winter, he was at laſt obliged to retreat to Pruſſia. In his march he was haraſſed by the Poles; and a body of 4000 Swedes was ſurpriſed and defeated by them at Warka. This loſs, however, was ſoon after recompenſed

90 War with the elector of Brandenburg. An. 1656.

91 The Poles revolt.

92 Charles gains a victory, but is obliged to retire.

Sweden.

recompenſed by a complete victory gained by Adolphus the king's brother and General Wrangel. In the mean time the king was taking meaſures for laying ſiege to Dantzic; but was prevented by the Dutch, who threatened to oppoſe him, unleſs a proper regard was paid to their intereſt. Charles accordingly granted them advantageous terms; and afterwards gained over the elector of Brandenburg, by ceding to him the ſovereignty of Pruſſia, that he might be at liberty to turn his whole ſtrength againſt Poland.

93 Concludes a treaty with the Dutch and the elector of Brandenburg.

By the treaty juſt concluded with the elector, the latter was to aſſiſt Charles in his war with Poland; but the elector had ſo procraſtinated matters, that the Poles, having obtained aſſiſtance from the Tartars, had reduced the city of Warſaw. The two princes, however, now marched in concert againſt their enemies, who were encamped in a ſtrong ſituation in the neighbourhood of the city above-mentioned, their camp being fronted by the Viſtula. The Poles were driven from their entrenchments with prodigious ſlaughter. The Poles and Tartars then laboured to break the alliance; with which view they entered Ducal Pruſſia, and defeated the electoral army, taking many priſoners. The Swedes ſoon had their revenge. General Steinboek attacked the ſame Poliſh army at Philippowa, and overthrew it with ſuch ſlaughter as obliged the Poles for that ſeaſon to quit the field. A more formidable enemy than the Poles now began to make their appearance. The Ruſſians invaded the provinces of Carelia, Ingermania, and Livonia; while the elector of Brandenburg began to waver in his fidelity. To preſerve this only ally at ſuch a critical juncture, Charles was obliged to give him more advantageous terms than thoſe already mentioned; while the Ruſſians were repulſed in the provinces of Carelia and Ingermania. But in Livonia they had better ſucceſs. See RUSSIA. For ſeven months, however, they battered the walls of Riga, without venturing to paſs the ditch or ſtorm the practicable breaches.

94 The Poles and Tartars defeated with great ſlaughter.

95 The Ruſſians invade the Swediſh dominions.

Charles, notwithſtanding the number of his enemies, was now become ſo formidable by the valour and diſcipline of his troops, that whole armies often fled on his approach. At laſt, in 1657, the Poles, finding they could not reſiſt him in the field, contented themſelves with haraſſing the Swedes on their march, and cutting off the foragers and convoys. This proved much more deſtructive to the Swedes than their former method; ſo that Charles was obliged to enter into an alliance with Ragotſki prince of Tranſylvania, by aſſigning him certain provinces in his neighbourhood, in order to furniſh himſelf with irregular troops, who might fight the Poles in their own way. This, however, proved of no real advantage; for the confederates, after waſting a whole campaign in Lithuania, were obliged to return without accompliſhing more than the reduction of a ſingle fortreſs; on which Charles returned with the Swediſh army to Pruſſia.

An. 1657.

96 Charles enters into an alliance with Ragotſki prince of Tranſylvania.

Leopold, the young king of Hungary, having long beheld the Swedes with a jealous eye, now reſolved to declare for Poland. The more effectually to curb the ambition of the Swediſh monarch, he ſolicited the king of Denmark to come to a rupture with him. This was inſtantly complied with, and the Danes invaded Bremen. Charles haſtened to oppoſe this new enemy; which gave ſuch offence to Ragotſki, that he neglected to take the proper meaſures for his own defence in the abſence of the Swedes, and ſuffered his army to be deſtroyed by the Poles and Tartars. At the ſame time the Turks invaded Tranſylvania, under pretence that Ragotſki, being a vaſſal of the Grand Signior, had no right to invade Poland without his leave. Ragotſki oppoſed them in the field; where he was defeated and killed, leaving Charles deſtitute of the only ally on whom he could depend.

97 Leopold king of Hungary declares againſt Sweden.

98 Ragotſki's army deſtroyed by the Poles and Tartars.

99 He is defeated and killed by the Turks.

The king, however, not diſmayed by this misfortune, traverſed Pomerania and the duchy of Mecklenburg; after which he attacked Holſtein, while General Wrangel with another corps entered the duchy of Bremen. The latter executed his meaſures with the utmoſt vigour. In 15 days he retook all the towns which the enemy had reduced; defeated and drove the Daniſh army out of the country, killing 3000 of their beſt ſoldiers. In Holſtein the king reduced ſeveral fortreſſes, laid Itzehoe in aſhes, defeated a body of Danes, and laid ſiege to Frederic Udda, into which the Danes had thrown a ſtrong garriſon. The conduct of this ſiege he left to Wrangel, he himſelf retiring to Wiſmar in order to obſerve the ſituation of affairs in Poland; but no ſooner was he gone than Wrangel attacked the place with ſuch fury, that he became maſter of it in two hours. In the province of Halland the Swedes were defeated; but the enemy derived no advantage from their victory: at ſea the fleets met, and maintained an engagement for two days, without any conſiderable advantage on either ſide. In Poland affairs were not better conducted. The houſe of Auſtria had now declared for Caſimir; a German army entered Poland, and reduced Cracow, though not without great loſs to themſelves.

100 Bravery and ſucceſs of General Wrangel.

101 The houſe of Auſtria declares againſt Sweden.

The king of Sweden was now ſurrounded by enemies. The elector of Brandenburg had declared againſt him; and he had beſides to engage the armies of Auſtria, Poland, Ruſſia, and Denmark. In this dangerous ſituation he reſolved to attack Denmark, ſo as to oblige that power to come to a ſpeedy accommodation. His deſigns were forwarded by a very early froſt, which enabled him to tranſport his troops without ſhipping. Having paſſed over on the ice to the iſland of Funen, he cut in pieces a body of 4000 Daniſh ſoldiers and 500 peaſants. The whole iſland was reduced in a few days; after which he paſſed to Langland, then to Laaland, after that to Falſtre, and laſtly to Zealand. The Danes were terrified at this unexpected invaſion, and were giving themſelves up to deſpair, when Charles offered to conclude a peace on equitable terms. The king of Denmark gladly conſented; intending to renew the war as ſoon as he thought it could be done with ſafety.

102 Charles invades Denmark with great ſucceſs.

103 Peace concluded. An. 1658.

Charles was no ſooner retired, than the king of Denmark began to act ſecretly againſt him; on which, reſolving to anticipate him in his deſigns, he appeared unexpectedly with a fleet before Copenhagen. The Swediſh monarch laid ſiege to the capital, but with ſo little prudence that he made no progreſs, and was at length compelled to turn the ſiege into a blockade, which continued to the end of the war. Charles X. died of an epidemic fever, and was ſucceeded by his ſon Charles XI.

104 The war renewed, and Copenhagen beſieged.

105 Charles XI. An. 1660.

The new king Charles XI. was a minor at the time of his father's death; and as the kingdom was involved in a dangerous war with ſo many enemies, the regency determined to conclude a peace, if it could be obtained on

Sweden.

106 Treaty of Oliva.

on reasonable terms. A treaty was accordingly concluded at Oliva; by which Casimir renounced his pretensions to the crown of Poland, and that republic gave up all pretensions to Livonia. Bornholm and Drontheim were ceded to Denmark; and an equivalent in Schonen remained with Sweden. During the minority of the king, nothing remarkable occurs in the history of Sweden. In 1672 he entered into alliance with Louis XIV. which two years after involved him in a war with the elector of Brandenburg. At first the Swedes carried all before them. Almost all the towns in Brandenburg were reduced, when the elector arrived with an army to the relief of his distressed subjects. He retook several towns, defeated the Swedes in a general engagement, and soon after forced them to abandon all their conquests. In conjunction with the Danes, he then invaded the Swedish dominions; many places of importance were reduced; and, in 1676, Sweden received a most destructive blow by the defeat of her fleet in an engagement with the combined fleets of Denmark and Holland. Soon after this the king took the government into his own hands, and in some degree restored the fortune of Sweden; but though matters went on in a more prosperous way where the king commanded in person, the same losses and disgrace attended the Swedish arms in every other quarter. In 1678, the Swedish fleet was defeated in two engagements. At Landscroon a most obstinate battle was fought from ten in the morning till six at night; when both parties were obliged, by fatigue, to retire to their respective camps. At Oldeval in Norway, the Swedes were defeated; and the Danes laid desolate the islands of Oeland, Smaaland, Unno, and Kuno; while the electoral troops and Imperialists reduced Count Konigsmark to the utmost distress in the neighbourhood of Stralsund.

107 War with Brandenburg.

108 The Swedes defeated by land and sea.

An. 1676.

109 Their affairs everywhere go to wreck.

In this deplorable situation of affairs Count Konigsmark found an opportunity of attacking his enemies to such advantage, that he obtained a complete victory; after which he ravaged the duchy of Mecklenburg. Notwithstanding this success, he could not prevent the elector from reducing Stralsund; after which he was obliged to evacuate Pomerania; and, to complete his distress, the fleet which transported the Swedish army from Pomerania was wrecked on the coast of Bornholm.

In this unprosperous situation of affairs a peace was concluded at St Germain's between France and her enemies, by which the Swedes and Danes were left to decide their quarrel by themselves. Denmark was by no means a match for Sweden, even in the distressed situation to which she was reduced; and therefore a treaty was concluded, on terms much more favourable to Sweden than could have been expected; and the peace was confirmed by a marriage between Charles and Ulrica Eleonora, daughter to the king of Denmark. From this time the Swedish monarch applied himself to the reformation of the state; and by artfully managing the disputes between the nobility and peasants, he obtained a decree empowering him to alter the constitution as he pleased. The proceedings of the king after this decree were such as to exasperate the nobility, and produce violent commotions. See PATKUL.

110 Peace concluded.

111 Charles becomes absolute.

On the 15th of April 1697, died Charles XI. leaving his crown to his son, the celebrated Charles XII. at that time a minor. On his accession he found himself under the tuition of his grandmother Eleonora, who had governed the kingdom during the minority of the late king. Though Charles was at that time only 15 years of age, he showed a desire of taking the government into his own hands. His counsellors, Count Piper and Axel Sparre, signified his desire to the queen-regent. They were by her referred to the states; and there all were unanimous: so that the queen, finding that opposition would be vain, resigned her power with a good grace; and Charles was invested with absolute authority in three days after he had expressed his desire of reigning alone. He was scarcely seated on the throne when a powerful combination was formed against him. Augustus king of Poland formed designs on Livonia; the king of Denmark revived the disputes he had with the duke of Holstein, as a prelude to a war with Sweden; and Peter the Great of Russia began to form designs on Ingria, formerly a province of Russia. In 1699 the king of Denmark marched an army into Holstein. Charles sent a considerable body of troops to the duke's assistance; but before their arrival the Danes had ravaged the country, taken the castle of Gottorp, and laid close siege to Tonningen. Here the king of Denmark commanded in person; and was assisted by the troops of Saxony, Brandenburg, Wolfenbuttle, and Hesse Cassel. England and Holland, as guarantees of the last treaty with Denmark, in concert with Sweden, joined Charles against this confederacy, and sent fleets to the Baltic. They proposed a termination of the war on equitable terms; but these were haughtily refused by the Danish monarch, who despised the youth and inexperience of Charles, and relied too much on the alliance he had formed with Saxony, Brandenburg, Poland, and Russia. Tonningen, however, resisted all his efforts; and when he ordered the place to be stormed, he had the mortification to see his troops driven headlong from the walls by a handful of Swedes.

112 Charles XI. dies, and is succeeded by his son Charles XII.

113 He takes the government into his own hands at the age of 15.

114 A powerful combination formed against him.

115 Holstein ravaged by the Danes. An. 1699.

116 They are repulsed at Tonningen.

In the year 1700, Charles, having entrusted the affairs of the nation with a council chosen out of the senate, set out on the 8th May from his capital, to which he never afterwards returned. He embarked at Carlscroon, and defeated the fleet of the allies. Having made a descent on the island of Zealand, he defeated a body of cavalry that opposed his march, and then proceeded to invest Copenhagen by sea and land. The king of Denmark then saw the necessity of either having his capital destroyed, or of doing justice to the duke of Holstein. He chose the latter; and a treaty was concluded on much the same terms as formerly. Charles, being thus at liberty to turn his arms against the other princes who had conspired his destruction, resolved to lead his army against Augustus king of Poland. On the road, however, he received intelligence that the tzar of Russia was on his march to oppose him, and had laid siege to Narva with an army of 100,000 men. The contest that ensued between Charles and Peter, with the celebrated battles of Narva and Pultava, have been already related under RUSSIA, so that we shall here confine ourselves chiefly to those events in which Peter the Great was not immediately concerned.

117 Charles sets out from Stockholm, and defeats the fleet of the allies. An. 1700.

118 Obliges the Danes to make peace.

119 Marches against the Russians.

The Tzar Peter was the chief support of Augustus, and he took the most active measures to oppose the progress of the Swedish monarch. His want of success, and the subsequent

Sweden.

ſequent conteſts between him and Charles, till the deciſive battle of Pultava are related in the article RUSSIA.

120 Charles marches againſt the Saxons An. 1701.

In 1701, as early as the ſeaſon permitted, Charles, having received a reinforcement from Sweden, took the field, and appeared ſuddenly on the banks of the Duna, along which the Saxon army was poſted to receive him. The king of Poland being at that time ſick, the army was commanded by Ferdinand duke of Courland, Mariſchal Stenau, and General Paykel, all officers of valour and experience. They had fortified certain iſlands in the mouth of the river, and taken every other precaution againſt an attack; the ſoldiers were hardy, well

121 and entirely defeats them.

diſciplined, and nearly equal to the Swedes in number; yet Charles, having paſſed the river in boats with high ſides, to ſcreen the men from the fire of the enemy, attacked them with ſuch fury, that they were entirely defeated with great loſs.

This victory was followed by the ſurrender of all the towns and fortreſſes in the duchy of Courland. Charles then paſſed into Lithuania, where every town opened its gates to him. At Birſen, an army of 20,000 Ruſſians retired with the utmoſt precipitation on the news of his approach. Here Charles, perceiving that the kingdom of

122 Forms a ſcheme for dethroning Auguſtus.

Poland was greatly diſaffected to Auguſtus, began to project the ſcheme of dethroning him by means of his own ſubjects. This ſcheme he executed with more policy than he ever ſhowed on any other occaſion.

123 Makes a ſecond application to no purpoſe.

Auguſtus, in the mean time, finding his ſcheme of peace fruſtrated, had recourſe to the ſenate; but met with ſuch a rough anſwer from them, that he determined to apply to Charles. To him therefore he ſent his

124 Warſaw taken.

chamberlain; but a paſſport being forgotten, the ambaſſador was arreſted. Charles continued his march to Warſaw, which ſurrendered on the firſt ſummons; but the citadel held out for ſome days. Auguſtus, finding at laſt that no dependence was to be placed on the Poles, determined to truſt his fortune wholly to the Saxon army and the nobility of the palatinate of Cracow, who offered to ſupport him to the utmoſt of their power. The Saxon army was now advanced to the frontiers, and Auguſtus immediately put himſelf at its head. Being joined by the nobility of Cracow, he found his forces to amount to 30,000 men, all brave and well-diſciplined. With theſe he marched in queſt of his enemy; who did not

125 The Saxons entirely defeated.

decline the combat, though he had with him only 12,000 men. Though the Saxons were ſtrongly poſted, having their front covered by a moraſs, beſides being fortified with palliſadoes and chevaux de friſe, they were attack-

126 Cracow taken.

ed with irreſiſtible impetuoſity, and entirely defeated. This victory was followed by the loſs of Cracow: after which Charles ſet out in purſuit of the flying army, with a deſign of preventing them from re-aſſembling; but his horſe falling under him, he had the misfortune to break his thigh, by which he was confined ſix weeks; and thus Auguſtus obtained ſome reſpite. He improved this interval. Having convoked a diet firſt at Marienburg, and then at Lublin, he obtained the following reſolutions; that an army of 50,000 men ſhould be raiſed by the republic for the ſervice of the prince; that ſix weeks ſhould be allowed the Swedes to determine whether they were for war or peace; and that the ſame time ſhould be granted to the turbulent and diſcontented nobles of Poland to make their conceſſions. To counteract the effects of theſe reſolutions, Charles aſſembled another diet at Warſaw; and while the two aſſemblies diſputed concerning their rights and privileges, he recovered from his wound, received a ſtrong reinforcement from Pomerania, and utterly defeated and diſperſed the remains of the Saxon army.

127 Remains of the Saxon army entirely defeated.

The ill fortune of Auguſtus continued ſtill to prevail. In 1704 he was formally depoſed by the diet, and the crown conferred by Charles on Staniſlaus Lecſinſky palatine of Poſnania. Auguſtus, however, did not yet tamely give up his kingdom. His adherents daily ſkir-

An. 1704.

128 Auguſtus formally depoſed, and Staniſlaus raiſed to the throne.

miſhed with the Swedes; and Auguſtus himſelf, being reinforced by 9000 Ruſſians, retook Warſaw, and was near ſurpriſing the new king, who lived in perfect ſecurity in the city while Charles fought in his cauſe. Count Horn, with 1500 Swedes, vigorouſly defended

129 Warſaw retaken by Auguſtus.

the citadel; but at laſt, finding it no longer tenable, he was obliged to ſurrender at diſcretion. The reduction of Warſaw was among the laſt advantages gained by Auguſtus in the courſe of this war. His troops were now compoſed of Saxon recruits and undiſciplined Poles, who had no attachment to his perſon, and were ready on all occaſions to forſake him. Charles and Staniſlaus advanced with the victorious army; the Saxons fled before them, and the towns ſeveral miles round ſent him their ſubmiſſions. The Poles and Saxons were under

130 Excellent conduct of his general Schullemberg.

the command of Schullemberg, a moſt ſagacious and experienced general, who uſed every expedient to check the progreſs of the Swedes. With all his conduct and caution, he found himſelf outwitted, and Charles in the neighbourhood of his camp ready to fall on him, while he thought him at 50 leagues diſtance. The Swediſh

131 His engagement with the Swedes.

monarch attacked him with a ſuperior army, but entirely compoſed of horſe. Schullemberg had poſted his men in ſuch a manner as rendered it impoſſible to ſurround them. His firſt rank being armed with pikes and fuſees, preſented a kind of rampart of bayonets; the ſecond line ſtooping over the firſt who kneeled, fired over their heads, while the third rank, who ſtood upon their feet, kept up an inceſſant fire, by which the Swediſh horſe were exceedingly galled and put in diſorder. Charles loſt the opportunity of cutting off the whole Saxon army, by omitting to order his men to diſmount. This was almoſt the firſt time that infantry had been regularly oppoſed to cavalry, and the ſuperiority of the former was evident. After the engagement had continued

132 His fine retreat.

about three hours, the Saxons retreated in good order; which no enemy had ever done before in any engagement with Charles. The Swedes purſued their enemies towards the Oder, and forced them to retreat through thick woods, almoſt impervious even to infantry. The Swediſh horſe, however, puſhed their way, and at laſt incloſed Schullemberg between a wood and the river, where Charles had no doubt of obliging him to ſurrender at diſcretion, or die ſword in hand, as having neither boats nor bridges; but the genius of Schullemberg ſupplied every defect. In the night he ordered planks and floats of trees to be faſtened together; on which he carried over his troops, while the Swedes were employed in diſlodging 300 men, which he had placed in a windmill, for the purpoſe of defending his flank and keeping the enemy in play. Charles ſpoke of this retreat with admiration, and ſaid he had been conquered by Schullemberg.

133 Auguſtus leaves Poland.

No material advantage, however, reſulted from this to Auguſtus; who was again obliged to leave Poland, and fortify

Sweden.

134 The Ruſſians take ſeveral towns in Livonia, and invade Poland.

fortify the capital of his hereditary dominions, which he expected every moment to ſee inveſted. In the mean time the Ruſſians having recovered their ſpirits, attacked the Swedes in Livonia with the utmoſt fury. Narva, Dorpt, and ſeveral other towns, were taken, and the inhabitants and garriſons treated with great barbarity. Soon after, an army of 100,000 Ruſſians entered Poland. Sixty thouſand Coſſacks under Mazeppa entered the country at the ſame time, and ravaged every thing with the fury of barbarians. Schullemberg, too, perhaps more formidable than either, advanced with 14,000 Saxons and 7000 Ruſſians, diſciplined in Germany, and reputed excellent ſoldiers. Could numbers have determined the event of war, the Swedes muſt certainly have been at this time overpowered. Inſtead of this, however, Charles ſeemed to triumph over his enemies with more eaſe the more numerous they were. The Ruſſians were defeated ſo faſt, that they were all diſperſed before one party had notice of the misfortunes of another. The defeating an army of 40,000 men ſcarcely obſtructed the march of the Swedes, while their aſtoniſhed enemies looked on theſe actions as the effects of witchcraft, and imagined that the king of Sweden had dealings with infernal ſpirits. With theſe apprehenſions they fled beyond the Dniepr, leaving the unhappy Auguſtus to his fate. Schullemberg, with all his ſkill and experience, ſucceeded no better. The Swediſh general Renſchild engaged and defeated him in half an hour, though the Swedes were vaſtly inferior in number, and their enemies poſted in a moſt advantageous ſituation. Nothing could be more complete than this victory. This extraordinary victory, indeed, is ſaid to have been owing to a panic which ſeized the troops of Schullemberg: but it was regarded with admiration, and thought to make the renown of Renſchild equal to that of his ſovereign. Charles himſelf was jealous, and could not help exclaiming, "Surely Renſchild will not compare himſelf with me!"

135 Aſtoniſhing ſucceſs of Charles againſt them.

136 Schullemberg entirely defeated by Renſchild.

137 Charles invades Saxony.

Soon after this victory, which was gained on the 12th of February, 1706, Charles entered Saxony at the head of 24,000 men. The diet at Ratiſbon declared him an enemy to the empire if he croſſed the Oder. But to this declaration no regard was paid. Charles purſued his march; while Auguſtus was reduced to the condition of a vagrant in Poland, where he poſſeſſed not a ſingle town except Cracow. Into this city he threw himſelf with a few Saxon, Poliſh, and Ruſſian regiments, and began to erect ſome fortifications for its defence; but the approach of the Swediſh general Meyerfeldt, and the news of the invaſion of Saxony, diſconcerted all his meaſures, and threw him into deſpair. The Ruſſians indeed were his faithful allies; but he dreaded them almoſt as much as the Swedes: ſo that he was reduced to the neceſſity of writing a letter to Charles with his own hand, begging for peace on whatever terms he thought proper to grant. However, as he was then at the mercy of the Ruſſians, this tranſaction was concealed with the greateſt care. His emiſſaries were introduced to the Swediſh court in the night-time; and being preſented to Charles, received the following anſwer: That King Auguſtus ſhould for ever renounce the crown of Poland, acknowledge Staniſlaus, and promiſe never to reaſcend the throne, ſhould an opportunity offer; that he ſhould releaſe the princes Sobieſki, and all the Swediſh priſoners made in the courſe of the war; ſurrender Patkul, at that time reſident at his court as ambaſſador for the tzar of Ruſſia, and ſtop proceedings againſt all who had paſſed from his into the Swediſh ſervice. Theſe articles, Charles wrote with his own hand, and delivered to Count Piper, ordering him to finiſh them with the Saxon ambaſſadors.

138 Auguſtus begs for peace on any terms.

139 Charles's anſwer.

After his defeat at Pultava by the Ruſſians, Charles fled in a mean calaſh, attended by a little troop inviolably attached to his perſon, ſome on foot, and ſome on horſeback. They were obliged to croſs a ſandy deſert, where neither herb nor tree was to be ſeen, and where the burning heat and want of water were more intolerable than the extremities of cold they had formerly ſuffered. The whole had almoſt periſhed for want of water, when a ſpring was fortunately diſcovered; after which they reached Otchakoff, a town in the Turkiſh dominions, the baſhaw of which ſupplied the king with every neceſſary. It was ſome time, however, before boats could be got ready for tranſporting the whole of the king's attendants; by which accident 500 Swedes and Coſſacks fell into the hands of the enemy. This loſs affected him more than all his other misfortunes. He ſhed tears at ſeeing, acroſs the river Bog, the greater part of his few remaining friends carried into captivity, without having it in his power to aſſiſt them. The baſhaw waited on him to apologiſe for the delay, and was ſeverely reprimanded by Charles, as if he had been his own ſubject.

140 Charles arrives in Turkey after his defeat at Pultava.

The king remained but a few days at Otchakoff, when the ſeraſquier of Bender ſent an aga to compliment him on his arrival in the Turkiſh dominions, and to invite him to that city. Here he was treated with hoſpitality: the Turks practiſed to its full extent their generous maxim of regarding as ſacred the perſons of unfortunate princes who had taken ſhelter in their dominions: and perhaps regarded him, notwithſtanding his misfortunes, as an ally that might be uſeful to themſelves againſt the Ruſſians. Every one, indeed, regarded him in his diſtreſs. The French king offered him a ſafe paſſage from the Levant to Marſeilles, from whence he might eaſily return to his own dominions. But Charles was too obſtinate to receive advice. Puffed up with the notion of imitating Alexander the Great, he diſdained to return except at the head of a numerous army; and he yet expected, by means of the Turks, to dethrone his adverſary the tzar. Negotiations for this purpoſe were carried on in the Turkiſh divan; and it was propoſed to eſcort Charles with a numerous army to the frontiers of Poland: but the revolution which took place there, put an end to all ſuch projects. Auguſtus thought himſelf no longer bound to obſerve the treaty which he had made, than while Charles was at hand to compel him. After the battle of Pultava, he entered Poland, and took every meaſure, in concert with the tzar, for the recovery of his kingdom. Staniſlaus was not able to ſtand before ſuch enemies, but was obliged to leave his dominions and fly to Bender, in the diſguiſe of a Swediſh officer, in order to ſhare the fortune of Charles.—It was not in Poland alone that the Swediſh affairs began to ſuffer in conſequence of the defeat at Pultava. The Danes invaded the province of Schonen with an army of 13,000 foot and 2500 horſe. Only 13,000 Swediſh forces remained to defend all the territories poſſeſſed by Charles in Germany; and of theſe only a ſmall part was allotted for the defence of Schonen.

141 Is kindly received, and his hopes of conquering Ruſſia begin to revive.

142 Auguſtus recovers the kingdom of Poland.

143 The Danes invade Sweden;

Sweden.

nen. The regency of Sweden, however, exerted themselves to the utmost to repel this ungenerous invasion; and having collected an army of 12,000 militia and 8000 regulars, dispatched them under General Steenboek into Schonen. Some Saxon troops were incorporated in this army; and among these a prodigious desertion took place, which the general found it impossible to prevent; and thus the Danes gained several advantages, and at last took Christianstadt. Their insolence on this success was so great, that the Swedes demanded to be instantly led against them. Here the good fortune of Sweden seemed once more to revive. The Danes were driven from a very strong situation, with the loss of 8000 killed and taken prisoners, besides a vast number wounded. The king received the intelligence of this victory with the greatest exultation; and could not help exclaiming, "My brave Swedes, should it please God that I once more join you, we shall conquer them all!"

144 but are utterly defeated.

In the mean time, Charles, by means of his agents the count Poniatoffski and the sieur Neugebar, used his utmost efforts to procure a rupture between the Porte and Russia. For a long time the money bestowed by Peter on the vizirs and janisaries prevailed; but at last, in 1711, the grand signior, influenced by his mother, who was strongly in the interest of Charles, and had been used to call him *her lion*, determined to support his quarrel with Peter. He therefore gave orders to the vizir to fall on the Russians with an army of 200,000 men. The vizir promised obedience; but at the same time professed his ignorance in the art of war, and dislike to the present expedition. The khan of Crim Tartary, who had been gained over by the reputation and presents of the king of Sweden, had orders to take the field with 40,000 of his men, and had the liberty of assembling his army at Bender, that Charles might see that the war was undertaken on his account. See Russia, N° 119.

145 The Turks declare war against the Russians.

The treaty of the Pruth was most violently opposed by Count Poniatoffski and the khan of Tartary. The former had made the king acquainted with the situation of both armies; on which he instantly set out from Bender, filled with the hopes of fighting the Russians, and taking ample vengeance. Having ridden 50 leagues post, he arrived at the camp just as the tzar was drawing off his half-famished troops. He alighted at Poniatoffski's tent; and being informed of particulars, instantly flew in a rage to the vizir, whom he loaded with reproaches, and accused of treachery. Recollecting himself, however, he proposed a method by which the fault might be remedied; but finding his proposal rejected, he posted back to Bender, after having by the grossest insults showed his contempt of the vizir.

The violent behaviour of Charles did not promote his interest. The vizir perceived that his stay in Turkey might prove fatal to himself; and therefore determined to get him out of the country as soon as possible. Succeeding vizirs adopted the same plan; and at last the grand signior himself wrote a letter to Charles, in which he desired him to depart by next winter, promising to supply him with a sufficient guard, with money, and every thing else necessary for his journey. Charles gave an evasive answer, and determined to procrastinate his journey, as well to gratify his own stubborn temper, as because he discovered a correspondence between Augustus and the khan of Tartary, the object of which, he had reason to believe, was to betray him to the Saxons. When he was again pressed to fix the day of his departure, he replied, that he could not think of going before his debts were paid. Being asked how much was necessary for this purpose, he replied, 1000 purses (A). Twelve hundred purses were instantly sent to the serasquier at Bender, with orders to deliver them to the king of Sweden, but not before he should have begun his journey. By fair promises, Charles persuaded him to part with the money; after which, instead of setting out, he squandered away his treasure in presents and gratifications, and then demanded 1000 purses more before he would set out. The serasquier was astonished at this behaviour. He shed tears; and, turning to the king, told him, that his head would be the forfeit of having obliged him with the money. The grand signior, on being acquainted with the shameful behaviour of Charles, flew into a rage, and called an extraordinary divan, where he himself spoke, a thing very unusual for the Turkish monarchs. It was unanimously agreed that such a troublesome guest ought to be removed by force, should other means fail. Positive orders were therefore sent to Charles to depart; and, in case of refusal, to attack him in his quarters. Nothing could equal his obstinacy on this occasion: in spite of the menaces of his enemies, in spite of the intreaties of his friends, he persisted in his resolution; and at last determined to resist, with 300 Swedes, being all the attendants he had, an army of 20,000 janisaries well armed and furnished with cannon. At length he was attacked in good earnest; though it must be owned, that even in this extremity, the Turks showed their regard to him, and were tender of his life, which the king did not return at all in a similar manner. Most of the Swedes surrendered at once, perhaps as thinking it the only method of saving the king's life. This misconduct, however, had a quite contrary effect. Charles became the more obstinate, the more desperate his affairs seemed to be. With 40 menial servants only, and the generals Hord and Dardorff, he determined to defend himself to the last extremity. Seeing his soldiers lay down their arms, he told the generals, "We must now defend the house. Come, (adds he with a smile), let us fight *pro aris et focis*." The house had been already forced by the Tartars, all but a hall which was near the door, and where his domestics had assembled. Charles forced his way through the janisaries, attended by the generals Hord and Dardorff, joined his people, and then barricaded the door. The moment he entered, the enemy, who were in the house, threw down their booty, and endeavoured to escape at the windows. Charles pursued them from room to room with much bloodshed, and cleared the house in a few minutes. He then fired furiously from the windows, killed 200 of the Turks in a quarter of an hour, so that the bashaw who commanded them was at length forced to set the house on fire. This

146 The grand signior desires him to depart.

147 Mean and unjust behaviour of Charles.

148 The Turks resolve to force him to depart.

149 His desperate resolution to resist.

150 Is abandoned by all his followers except 40.

151 Fights like a madman, but is taken prisoner with all his followers.

(A) Each purse contained 30 sequins.

Sweden.

This was done by arrows with lighted matches ſhot into the roof; but Charles, inſtead of quitting it, gave orders for extinguiſhing the fire, in which he himſelf aſſiſted with great diligence. All efforts, however, were vain: the roof fell in; and Charles, with his few faithful companions, was ready to be buried in the ruins. In this extremity one called out, that there was a neceſſity for ſurrendering. "What a ſtrange fellow! (cries the king), who would rather be a priſoner with the Turks than mix his aſhes with thoſe of his ſovereign." Another had the preſence of mind to cry out, that the chancery was but 50 paces off, had a ſtone roof, and was proof againſt fire. Pleaſed with the thoughts of again coming to blows, the king exclaimed, "A true Swede! Let us take all the powder and ball we can carry." He then put himſelf at the head of his troops, and ſallied out with ſuch fury, that the Turks retreated 50 paces; but falling down in the hurry, they ruſhed in upon him, and carried him by the legs and arms to the baſhaw's tent.

This extraordinary adventure, which ſavours not a little of inſanity, happened on the 12th of February 1713. He was now kept priſoner, with all his retinue; and in this ſituation he was viſited by the unfortunate Staniſlaus.

152 Begins to think of returning to his dominions.

Charles at laſt ſeemed inclined to ſubmit to his fate, and began ſeriouſly to think of returning to his kingdom, now reduced to the moſt deplorable ſituation. His habitation was now fixed at Demotica, a ſmall town about ſix leagues from Adrianople. Here he was allowed proviſions for his own table and thoſe of his retinue; but only 25 crowns a-day in money, inſtead of 500 which he had received at Bender. During his reſidence here he received a deputation from Heſſe Caſſel, ſoliciting his conſent to the marriage of the landgrave with Eleonora, princeſs royal of Sweden; to which he readily agreed: a deputation was alſo ſent him by the regency of Sweden, requeſting that he would prepare for returning to his own dominions, which were ready to ſink under a ruinous war in his abſence.

153 Sets out for Sweden. An. 1714.

On the 14th of October 1714, Charles ſet out for Sweden. All the princes through whoſe territories he was to paſs, had given orders for his entertainment in the moſt magnificent manner; but the king, perceiving that theſe compliments only rendered his impriſonment and other misfortunes more conſpicuous, ſuddenly diſmiſſed his Turkiſh attendants, and aſſembling his own people, bid them take no care about him, but make the beſt of their way to Stralſund. After this he ſet out poſt, in the habit of a German officer, attended only by Colonel During. Keeping the bye-roads through Hungary, Moravia, Auſtria, Bavaria, Wirtemberg, the Palatinate, Weſtphalia, and Mecklenburg, he arrived on the 21ſt of November at midnight before the gates of Stralſund. Being unknown, he was admitted with difficulty; but being ſoon recogniſed by the governor, the greateſt tokens of joy were ſhown all over the town. In the midſt of the tumult Charles went to bed.

154 Diſmiſſes his retinue, and proceeds with only one attendant.

155 Arrives at Stralſund, and is received with the utmoſt joy.

Sweden was now in the greateſt diſtreſs. On the news of the defeat at Pultava, the Danes had invaded Schonen, but were defeated by General Steenboek. This victory, however, did not put an end to the war. On the contrary, the kings of Denmark and Poland, with the tzar of Ruſſia, entered into ſtricter bonds of amity than ever. They dreaded the return of Charles to his own dominions, and apprehended that numberleſs victories would ſoon efface the remembrance of Pultava. They determined, therefore, to make the beſt uſe of their time; and perhaps Charles never took a more imprudent reſolution than obſtinately to remain ſo long in the Turkiſh dominions. The return of Charles ſeemed to give new life to the whole nation. Though the number of inhabitants was viſibly diminiſhed, the levies he had ordered were completed in a few weeks: but the hands left to cultivate the earth conſiſted of the infirm, aged, and decrepid; ſo that a famine was threatened in conſequence of the military rage which had ſeized all the youth of the kingdom.

156 Diſtreſſed ſituation of Sweden.

157 The king is unable to retrieve the Swediſh affairs. An. 1715.

The preſence of Charles did not now produce thoſe conſequences which the allies had feared. The kingdom was too much reduced to furniſh the neceſſary ſupplies of men and money; and though the king's courage and military ſkill were not in the leaſt diminiſhed, the efforts he made, inſtead of reſtoring Sweden to its ſplendour, ſerved more completely to ruin it. In 1715, Pruſſia declared againſt him, on account of his demanding back the town of Stetin, which that monarch had ſeized. To complete his embarraſſment, the elector of Hanover, George I. of Britain, alſo became his enemy. The forces of Denmark, Pruſſia, Saxony, and Hanover, joined to inveſt Wiſmar, while a body of 36,000 men formed the ſiege of Stralſund; at the ſame time that the tzar, with a fleet of 20 large ſhips of war, and 150 tranſports, carrying 30,000 men, threw every part of the Swediſh coaſt into the greateſt conſternation. The heroiſm of Charles could not prevail againſt ſo many enemies; yet he was ſtill ſo much dreaded, that the prince of Anhalt, with 12,000 brave troops, did not think himſelf a match for this furious enemy when at the head of only 2000, till he had entrenched his army behind a ditch, defended by chevaux de frize. It appeared, indeed, that his precaution was not unneceſſary: for in the night Charles with his men clambered up the ditch, and attacked the enemy in his uſual manner. Numbers, however, at laſt prevailed; and Charles was obliged to retire, after having ſeen his favourite Grothuſen, General Dardorff and During, the companions of his exile, killed by his ſide, he himſelf being wounded in the breaſt.

158 Is encompaſſed on all ſides by enemies.

159 His deſperate valour.

160 Stralſund beſieged,

This raſh attempt was made in order to ſave Rugen, whence the town of Stralſund was ſupplied with proviſions. The place was well fortified, and garriſoned with 9000 men, with Charles himſelf at their head; but nothing could reſiſt the efforts of the enemy. By the 17th of December it was propoſed to give the aſſault. The attack on the horn-work was deſperate: the enemy was twice repulſed; but at laſt, by dint of numbers, effected a lodgement. The next day, Charles headed a ſally, in which he dealt terrible deſtruction among the beſiegers, but was at length overpowered and obliged to retreat into the town. At laſt his officers, apprehending that he muſt either fall into the hands of the enemy, or be buried in the ruins of the place, intreated him to retire. A retreat, however, was now almoſt as dangerous as to remain in the town, on account of the fleets of the enemy with which the ſea was covered; and it is thought that this very circumſtance induced the king to conſent to it. Setting out, therefore,

161 and taken, in ſpite of the utmoſt efforts of the king.

Sweden.

therefore, in a ſmall boat with ſails and oars, he paſſed all the enemy's ſhips and batteries, and arrived ſafe at Yſtedt in Schonen.

162 Charles invades Norway to no purpoſe.

To revenge himſelf for theſe loſſes, Charles invaded Norway with an army of 25,000 men. The Danes were every where defeated and purſued with that vigour for which the king of Sweden was ſo remarkable; but ſtrong reinforcements arriving from Denmark, and proviſions failing, he was at laſt obliged to retire. Soon after this the Swedes loſt Wiſmar; but when every thing ſeemed hopeleſs, Baron Goertz the chief miniſter and favourite of Charles contrived to ſet on foot a treaty with the tzar of Ruſſia, by which the moſt formidable of all Charles's enemies was taken off. The miniſter found means to work on the inflexible temper of Charles, by repreſenting to him that the ceſſion of certain provinces to Peter would induce him to aſſiſt him in his projects of again dethroning Auguſtus, and of replacing James on the throne of Britain; which laſt ſcheme he had projected out of revenge for the elector of Hanover having ſeized on the duchies of Bremen and Verden. In conſequence of the conferences between the tzar and Goertz, the former engaged to ſend into Poland an army of 80,000 men, in order to dethrone that prince whom he had ſo long defended. He engaged alſo to furniſh ſhips for tranſporting 30,000 Swedes to Germany and 10,000 into Denmark. This treaty, however, was not ratified; and the king's death, which happened in 1718, put a final ſtop to all the great proſpects of Sweden.

163 A treaty with the tzar of Muſcovy projected.

164 Charles invades Norway again, and lays ſiege to Frederickſhall.

The king had reſolved on the conqueſt of Norway before he dethroned Auguſtus; and as no difficulties ever deterred him, he marched his army into that cold and barren country in the month of October, when the ground was covered with froſt and ſnow. With 18,000 men he formed the ſiege of Frederickſhall, though the ſeverity of the froſt rendered it almoſt impoſſible to break ground. Charles reſolved to form trenches; and his ſoldiers cheerfully obeyed, digging into the ground with the ſame labour as if they had been piercing a rock. On the 11th of December the king viſited the trenches in the midſt of a terrible fire from the enemy, imagining that his men might be animated by his preſence. He took his poſt in the moſt dangerous ſtation he could chooſe, ſtanding on a gabion and leaning with his arm over the parapet, while the enemy were firing chain ſhot at the very ſpot where he ſtood. He was intreated to change his ſtation; but he remained obſtinate. At laſt he was ſeen to fall on the parapet with a deep groan, and ſoon afterwards expired, having been mortally wounded, as is ſuppoſed, by a cannon ball. See CHARLES XII.

165 His extreme raſhneſs, in conſequence of which he is killed. An. 1718.

166 Account of the Swediſh affairs from the death of Cha. XII. to the year 1771.

Charles XII. was ſucceeded by his ſiſter the princeſs Ulrica Eleonora, wife to the hereditary prince of Heſſe. On this occaſion the ſtates took care to make a previous ſtipulation for the preſervation of their liberties, and obliged the princeſs to ſign a paper to this purpoſe before entering on the government. Their firſt care was to make a peace with Great Britain, which the late king intended to have invaded. The Swedes then, to prevent their farther loſſes by the progreſs of the Ruſſian, the Daniſh, the Saxon, and other arms, made many great ſacrifices to obtain peace from thoſe powers. The French, however, about the year 1738, formed a dangerous party in the kingdom, which not only broke its internal quite, but led it into a ruinous war with Ruſſia, by which it loſt the province of Finland. Their Swediſh majeſties having no children, it was neceſſary to ſettle the ſucceſſion; eſpecially as the duke of Holſtein was deſcended from the queen's eldeſt ſiſter, and was, at the ſame time, the preſumptive heir to the empire of Ruſſia. Four competitors appeared; the duke of Holſtein Gottorp, Prince Frederic of Heſſe-Caſſel nephew to the king, the prince of Denmark, and the duke of Deux-Ponts. The duke of Holſtein would have carried the election, had he not embraced the Greek religion, that he might mount the throne of Ruſſia. The tzarina interpoſed, and offered to reſtore all the conqueſts ſhe had made from Sweden, excepting a ſmall diſtrict in Finland, if the Swedes would receive the duke of Holſtein's uncle, Adolphus Frederic biſhop of Lubec, as their hereditary prince and ſucceſſor to their crown. This was agreed to; and a peace concluded at Abo, under the mediation of his Britannic majeſty. This peace was ſo firmly adhered to by the empreſs of Ruſſia, that his Daniſh majeſty thought proper to drop all reſentment for the indignity done his ſon. The prince-ſucceſſor married the princeſs Ulrica, third ſiſter to the king of Pruſſia; and in 1751 entered into the poſſeſſion of his new dignity, which proved to him a crown of thorns. The French had acquired vaſt influence in all the deliberations of the Swediſh ſenate, who of late had been little better than penſioners to that crown. The intrigues of the ſenators forced Adolphus to take part in the war againſt Pruſſia: but as that war was diſagreeable not only to the people, but alſo to the king of Sweden, the nation never made ſo mean an appearance; and on Ruſſia's making peace with the king of Pruſſia, the Swedes likewiſe made peace. Adolphus died diſpirited in 1771, after a turbulent reign of twenty years; and was ſucceeded by his ſon Guſtavus. The moſt remarkable tranſaction of this reign is the revolution which took place in the government in the year 1772, by which the king, from being the moſt limited became one of the moſt deſpotic monarchs in Europe. Ever ſince the death of Charles XII. the whole power of the kingdom had been lodged in the ſtates; and this power they had much abuſed. Guſtavus therefore determined either to ſeize on that power of which they made ſuch a bad uſe, or periſh in the attempt. The revolution was effected in the following manner. On the morning of the 19th of Auguſt 1772, a conſiderable number of officers, as well as other perſons known to be attached to the royal cauſe, had been ſummoned to attend his majeſty. Before ten he was on horſeback, and viſited the regiment of artillery. As he paſſed through the ſtreets he was more than uſually courteous to all he met, bowing familiarly to the loweſt of the people. On the king's return to his palace, the detachment which was to mount guard that day being drawn up together with that which was to be relieved, his majeſty retired with the officers into the guard-room. He then addreſſed them with all that eloquence of which he is ſaid to have been a perfect maſter; and after inſinuating to them that his life was in danger, he expoſed to them in the ſtrongeſt colours the wretched ſtate of the kingdom, the ſhackles in which it was held by means of foreign gold, and the diſſenſions and troubles ariſing from the ſame cauſe which had diſtracted the diet during the courſe of fourteen

Sweden.

An. 1751. 167 Acceſſion of Adolphus Frederic.

168 Guſtavus III ascends the throne. An. 1771.

169 Account of the revolution in 1772, by which he became deſpotic.

Sweden.

teen months. He assured them that his only design was to put an end to these disorders; to banish corruption, restore true liberty, and revive the ancient lustre of the Swedish name, which had been long tarnished by a venality as notorious as it was disgraceful. Then assuring them in the strongest terms that he disclaimed for ever all absolute power, or what the Swedes call *sovereignty*, he concluded with these words: "I am obliged to defend my own liberty and that of the kingdom, against the aristocracy which reigns. Will you be faithful to me, as your forefathers were to Gustavus Vasa and Gustavus Adolphus? I will then risk my life for your welfare and that of my country."

The officers, most of them young men, of whose attachment the king had been long secure, who did not thoroughly perhaps see into the nature of his majesty's request, were allowed no time to reflect, immediately consented to every thing, and took an oath of fidelity to him.

170 Resolution of a Swedish officer.

Only three refused. One of these, Frederic Cederstrom, captain of a company of the guards, alleged he had already, and very lately, taken an oath to be faithful to the states, and consequently could not take that which his majesty then exacted of him. The king, looking at him sternly, answered, "Think of what you are doing." "I do, (replied Cederstrom); and what I think to day, I shall think to-morrow: and were I capable of breaking the oath by which I am already bound to the states, I should be likewise capable of breaking that which your majesty now requires me to take."

The king then ordered Cederstrom to deliver up his sword, and put him in arrest.

His majesty, however, apprehensive of the impression which the proper and resolute conduct of Cederstrom might make on the minds of the other officers, shortly afterwards softened his tone; and again addressing himself to Cederstrom, told him, that as a proof of the opinion he entertained of him, and the confidence he placed in him, he would return him his sword without insisting on his taking the oath, and would only desire his attendance that day. Cederstrom continued firm; he answered, that his majesty could place no confidence in him that day, and that he begged to be excused from the service.

While the king was shut up with the officers, Senator Ralling, to whom the command of the troops in the town had been given two days before, came to the door of the guard-room, and was told that he could not be admitted. The senator insisted on being present at the distribution of the orders, and sent to the king to desire it; but was answered, he must go to the senate, where his majesty would speak to him.

The officers then received their orders from the king; the first of which was, that the two regiments of guards and of artillery should be immediately assembled, and that a detachment of 36 grenadiers should be posted at the door of the council-chamber to prevent any of the senators from coming out.

But before the orders could be carried into execution, it was necessary that the king should address himself to the soldiers; men wholly unacquainted with his designs, and accustomed to pay obedience only to the orders of the senate, whom they had been taught to hold in the highest reverence.

Sweden.

171 The king gains over the soldiers.

As his majesty, followed by the officers, was advancing from the guard room to the parade for this purpose, some of them more cautious, or perhaps more timid than the rest, became, on a short reflection, apprehensive of the consequences of the measure in which they were engaged: they began to express their fears to the king, that unless some persons of greater weight and influence than themselves were to take a part in the same cause, he could scarcely hope to succeed in his enterprise. The king stopped a while, and appeared to hesitate. A serjeant of the guards overheard their discourse, and cried aloud,—"It shall succeed—Long live Gustavus!" His majesty immediately said, "Then I will venture;"—and stepping forward to the soldiers, he addressed them in terms nearly similar to those which he had expressed to the officers, and with the same success. They answered him with loud acclamations: one voice only said, No; but it was not attended to.

In the mean time some of the king's emissaries had spread a report about the town that the king was arrested. This drew the populace to the palace in great numbers, where they arrived as his majesty had concluded his harangue to the guards. They testified by reiterated shouts their joy at seeing him safe; a joy which promised the happiest conclusion to the business of the day.

172 Secures the senators, and becomes master of the whole power in the kingdom.

The senators were now immediately secured. They had from the window of the council-chamber beheld what was going forward on the parade before the palace; and, at a loss to know the meaning of the shouts they heard, were coming down to inquire into the cause of them, when 30 grenadiers, with their bayonets fixed, informed them it was his majesty's pleasure they should continue where they were. They began to talk in a high tone, but were answered only by having the door shut and locked on them.

The moment the secret committee heard that the senate was arrested, they separated of themselves, each individual providing for his own safety. The king then mounting his horse, followed by his officers with their swords drawn, a large body of soldiers, and numbers of the populace, went to the other quarters of the town where the soldiers he had ordered to be assembled were posted. He found them all equally willing to support his cause, and to take to him an oath of fidelity. As he passed through the streets, he declared to the people, that he only meant to defend them, and save his country; and that if they would not confide in him, he would lay down his sceptre, and surrender up his kingdom. So much was the king beloved, that the people (some of whom even fell down on their knees) with tears in their eyes implored his majesty not to abandon them.

173 Summons an assembly of the states;

The king proceeded in his course, and in less than an hour made himself master of all the military force in Stockholm. In the mean time the heralds, by proclamation in the several quarters of the city, summoned an assembly of the States for the ensuing morning, and declared all members traitors to their country who should not appear. Thither his majesty repaired in all the pomp of royalty, surrounded by his guards, and holding in his hand the silver sceptre of Gustavus Adolphus. In a very forcible speech, he lamented the unhappy state to which the country was reduced by the conduct of a party

Sweden.

party ready to ſacrifice every thing to its ambition, and reproached the ſtates with adapting their actions to the views of foreign courts, from which they received the wages of perfidy. "If any one dare contradict this, let him riſe and ſpeak."—Conviction, or fear, kept the aſſembly ſilent, and the ſecretary read the new form of government, which the king ſubmitted to the approbation of the ſtates. It conſiſted of fifty-ſeven articles; of which the five following were the chief.

174 which accepts a new form of government.

1. The king has the entire power of convoking and diſſolving the aſſembly of the ſtates as often as he thinks proper. 2. His majeſty alone has the command of the army, fleet, and finances, and the diſpoſal of all offices civil and military. 3. In caſe of an invaſion, or of any preſſing neceſſity, the king may impoſe taxes, without waiting for the aſſembly of the ſtates. 4. The diet can deliberate on no other ſubjects than thoſe propoſed by the king. 5. The king ſhall not carry on an offenſive war without the conſent of the ſtates. When all the articles were gone through, the king demanded if the ſtates approved of them, and was anſwered by a general acclamation. He then diſmiſſed all the ſenators from their employments, adding, that in a few days he would appoint others; and concluded this extraordinary ſcene by drawing out of his pocket a ſmall book of pſalms, from which, after taking off the crown, he gave out Te Deum. All the members very devoutly added their voices to his, and the hall reſounded with thankſgiving.

175 The king makes a good uſe of his power.

The power thus obtained was employed by the king for the good of his ſubjects. He took care that the law ſhould be adminiſtered with impartiality to the richeſt noble and the pooreſt peaſant, making a ſevere example of ſuch judges as were proved to have made juſtice venal. He gave particular attention and encouragement to commerce, was a liberal and enlightened patron of learning and ſcience, and laboured ſtrenuouſly to introduce into his kingdom the moſt valuable improvements in agriculture that had been made in foreign countries.

176 Reforms the army and navy.

But while thus active in promoting the arts of peace, he was not inattentive to thoſe of war. The fleet, which he found decayed and feeble, he in a few years reſtored to a reſpectable footing, and, beſides changing the regulations of the navy, he raiſed a new corps of ſailors, and formed them to the ſervice by continual exerciſe. The army, which, as well as the navy, had been neglected during the ariſtocracy, was next to be reformed. The king began by giving cloaks, tents, and new arms to all the regiments. Afterwards, under the direction of Field Marſhal Count de Heſſenſtein, a new exerciſe was introduced, and ſeveral camps were formed, in which the ſoldiery were manœuvred by the king himſelf. The ſale of military offices, which had been permitted for many years, was entirely ſuppreſſed; and the king provided not only for the re-eſtabliſhment of diſcipline and good order in the army, but for the future welfare of the individuals which compoſed it. Theſe warlike preparations were neceſſary to a plan which he had formed for entirely aboliſhing the power of the ariſtocracy, and freeing Sweden from the factions which had long been formed in it by the court of St Peterſburgh. The change which he had introduced was very inimical to the intrigues of that court; and the Ruſſian ambaſſador exerted himſelf openly to bring about a rupture between the king and the diſcontented nobles. Guſtavus ordered him to quit the kingdom in eight days, and immediately prepared for war with Ruſſia. To this apparently raſh enterpriſe he was incited by the Ottoman Porte, at that time unable to oppoſe the armies of the two empires; and his own ambition, together with the internal ſtate of his kingdom, powerfully concurred to make him lend every aſſiſtance to his ancient ally. It is needleſs for us to enter into a detail of the particulars of that war, the principal circumſtances of which have already been noticed under RUSSIA, N°. 157. Suffice it to ſay, that neither Guſtavus Adolphus nor Charles XII. gave greater proofs of undaunted courage and military conduct in their long and bloody wars than were given by Guſtavus the III. from the end of the year 1787 to 1790, when peace was reſtored between the courts of St Peterſburgh and Stockholm. When the court of Copenhagen was compelled, by the means of England and Pruſſia, to withdraw its troops from the territories of Sweden, the king attacked Ruſſia with ſuch vigour both by ſea and land, diſplayed ſuch addreſs in retrieving his affairs when apparently reduced to the laſt extremity, and renewed his attacks with ſuch pertinacious courage, that the empreſs lowered the haughtineſs of her tone, and was glad to treat with Guſtavus as an equal and independent ſovereign.

177 His conduct in the war with Ruſſia.

178 Not an arbitrary deſpot, though in ſome actions artful and inſidious.

The king of Sweden was now at liberty to cheriſh again the arts of peace, and to humble the haughty ſpirit of the nobles. For his attempting to deprive thoſe men of that power which they had for many years employed againſt their country, he has been held up to the world as a deſpot who trampled on the liberties of his ſubjects; as a man without ſincerity or patriotiſm; and, in one word, as a perjured tyrant, who overthrew the conſtitution which he had ſworn to maintain. That he was not troubled with a ſcrupulous conſcience, when ſo artfully conducting the revolution of 1772, muſt be acknowledged; nor can it be denied, that in his treaties with other powers, he ſometimes endeavoured to overreach them; but if the neceſſities of ſtate could in any caſe be an apology for falſehood, they would ſufficiently apologiſe for the duplicity of Guſtavus. He was engaged in the arduous enterpriſe of freeing his ſubjects from an ariſtocratic tyranny, ſupported by a foreign power the moſt formidable in the north; he had been forced into a war with that power, and, as there is reaſon to believe, promiſed aſſiſtance which he never received; and it cannot excite wonder nor great indignation, that, as ſoon as he could make an honourable peace, he embraced the opportunity without paying much regard to the intereſts of an alliance, which tamely looked on while he was ſtruggling with difficulties apparently inſurmountable. That the revolution which he effected in his own country was calculated to promote the general good of the people is unqueſtionable; and to gain ſuch an object he might ſurely reſtore the crown to its ancient ſplendour, without bringing on his government the odious epithet of *deſpotiſm*.

179 The revolution beneficial.

The nobles, however, continued diſcontented, and a conſpiracy was planned againſt Guſtavus under his own roof. He had entered into the alliance that was formed againſt the revolutionary government of France; and to raiſe an army, which he was to lead in perſon to co-operate with the emperor and the king of Pruſſia, he was obliged to negociate large loans, and to impoſe on his ſubjects heavy taxes. The nobles took advantage of that circumſtance to prejudiſe the minds of many of the people

180 Produces a conſpiracy againſt the king's life. An. 1792.

Sweden.

people against the sovereign who had laboured so long for their good. On the 16th of March 1792 he received an anonymous letter, warning him of his immediate danger from a plot that was laid to take away his life, requesting him to remain at home, and avoid balls for a year; and assuring him that, if he should go to the masquerade for which he was preparing, he would be assassinated that very night. The king read the note with contempt, and at a late hour entered the ball-room. After some time he sat down in a box with the compte d'Essen, and observed that he was not deceived in his contempt for the letter, since had there been any design against his life, no time could be more favourable than that moment. He then mingled, without apprehension, among the crowd; and just as he was preparing to retire in company with the Prussian ambassador, he was surrounded by several persons in masks, one of whom fired a pistol at the back of the king, and lodged the contents in his body. A scene of dreadful confusion immediately ensued. The conspirators, amidst the general tumult and alarm, had time to retire to other parts of the room; but one of them had previously dropped his pistols and a dagger close by the wounded king. A general order was given to all the company to unmask, and the doors were immediately closed; but no person appeared with any particular distinguishing marks of guilt. The king was immediately conveyed to his apartment; and the surgeon, after extracting a ball and some slugs, gave favourable hopes of his recovery.

181 The king dangerously wounded.

182 Death of Gustavus III. An. 1792.

The favourable reports of his medical attendants soon appeared to be fallacious, and on the 28th of March a mortification was found to have taken place. He expired on the following day, and on opening his body there were found within the ribs a square piece of lead and two rusty nails.

The king had by his will appointed a council of regency; but convinced by recent experience how little dependence was to be placed on the attachment of his nobles, and aware of the necessity of a vigorous government in times of such difficulty and danger, he appointed his brother, the duke of Sudermania, sole regent, till his son, then a minor, should attain the age of 18 years. In his dying moments he desired that all the conspirators, except the perpetrator of his murder, might be pardoned.

183 Accession of Gustavus IV.

The young king, who was about 14 at his father's death, was proclaimed by the name of Gustavus IV. The regent soon took the most vigorous and active measures to apprehend and punish the projectors and perpetrators of the murder of his brother. A nobleman of the name of Ankerstrom confessed himself the assassin, and gloried in the action, which he called liberating his country from a monster and a tyrant. He was executed in a most cruel manner on the 17th of May. Two other noblemen, and two officers, also suffered death; but the rest of the conspirators were either pardoned, or punished only by fine and imprisonment.

From the accession of Gustavus IV. till the revolution which has been recently effected in Sweden, few transactions of any importance have occurred. Soon after the king had taken on himself the administration of affairs, he engaged warmly in the war against France, and till the time of his deposition, continued a most faithful ally of Britain. The efforts of the Swedish monarch towards humbling the power of Bonaparte, have been already noticed under the articles BRITAIN and FRANCE; and the war with Russia, in which his alliance with Britain had involved him, has been sufficiently touched in the article RUSSIA. This prince seems to have been endowed with great and amiable qualities, but he was certainly rash and imprudent in a high degree. He thus materially injured his kingdom, and alienated the affections of his principal nobles, especially of his uncle the duke of Sudermania.

184 Revolution in favour of the duke Sudermania. An. 1809.

In the beginning of March 1809, the plan which appears to have been concerted between the duke of Sudermania and the principal nobility, was carried into effect. The king was arrested; the duke assumed the reins of government, and issued the following proclamation.

"We, Charles, by the grace of God, Hereditary Prince of Sweden, the Goths, Vandals, &c. Duke of Sudermania, Grand Admiral, &c. &c. do declare, that under existing circumstances, his majesty is incapable of acting, or of conducting the important affairs of the nation. We have therefore (being the nearest and only branch of the family of age) been induced, for the time being, as administrator of the kingdom, to take the reins of government into our hands, which, with the help of the Almighty, we will conduct so that the nation may regain peace, both at home and abroad, and that trade and commerce may revive from their languishing state.

"Our inviolable intention is, to consult with the states on the means to be taken to render the future time happy to the people of Sweden. We invite and command, therefore, all the inhabitants of our nation, our forces by sea and land, and also the civil officers of all degrees, to obey us, as our real intention, and their welfare demand.

"We recommend you all to the protection of God Almighty.

"Done at Stockholm palace,
the 13th March, 1809.

(Signed) { "Charles.
"C. Laberlering."

185 Deposition of Gustavus, and accession of Charles XIII.

Soon after Gustavus was prevailed on to abdicate the government, and the duke of Sudermania was declared king of Sweden, by the title of Charles XIII.

The new king soon made propositions to the emperors of France and Russia for a cessation of hostilities between these powers and Sweden. Peace was speedily obtained, but on terms the most humiliating and disadvantageous to Sweden, as she has been compelled to surrender to the emperor Alexander all her territory to the eastward of the gulf of Bothnia and the river Tornea. A new constitution has been promulgated by King Charles; but the particulars of this code, which, from the enfeebled state of Sweden, reduced almost to the condition of a Russian province, is not likely to be of long continuance, can scarcely be interesting to our readers (B).

(B) It is understood that the health of the reigning monarch is in a declining state, so that a new vacancy in the throne of Sweden may be expected soon to take place. It is not impossible, that on such an event, the ambitious views

Sweden.

186 Population of Sweden.

The population of Sweden, even before the late treaty, was very inconſiderable, and is uſually ſuppoſed not to have exceeded 3,000,000, of which number Swediſh Lapland ſcarcely contained $\frac{1}{1000}$ part. As Finland appears to have been among the moſt populous diſtricts, we may conjecture that the loſs of that territory muſt have reduced the population by at leaſt 500,000; ſo that it is probable the preſent population of the countries ſubject to the crown of Sweden does not exceed 2,500,000. The moſt numerous part of this population is of courſe formed by peaſants, who have been computed at $\frac{2}{3}$ of the whole. Of the reſt the nobility was ſuppoſed to form $\frac{1}{100}$ part, comprehending at leaſt 2,500 families.

187 Government.

We have ſeen, that from the reign of Charles XII. to the revolution under Guſtavus III. in 1772, the government of Sweden was a limited monarchy, and that ſince that time, till the acceſſion of the preſent king (Charles XIII.) the power of the monarchs has been abſolute. The new conſtitution aims at bringing affairs back to their former ſtate; but how far it will be productive of that effect time alone can determine.

188 Revenues.

The revenue of Sweden, ſince the unfortunate reign of Charles XII. has been much reduced. Her gold and ſilver ſpecie, in the reign of Adolphus Frederick, aroſe chiefly from the king's German dominions. Formerly the crown lands, poll-money, tithes, mines, and other articles, are ſaid to have produced 1,000,000l. ſterling, and probably the whole preſent revenue does not amount to a million and a half. The national debt of this country, due chiefly to the moneyed men in Hamburgh, is ſuppoſed to amount to about 10,000,000 ſterling.

189 Military ſtrength.

The Swediſh army is compoſed of national troops, and of foreign auxiliaries; the latter being eſtimated at about 12,000, while the former do not amount to 40,000. The ſoldiers are of diſtinguiſhed valour, and very hardy, and ſtill retain the remembrance of the heroic deeds of their anceſtors.

Before the year 1792, the Swediſh fleet conſiſted of about 30 ſhips of the line; but at preſent it is reduced to not more than one-half, and theſe but ill appointed.

190 Coins.

The only gold coin in Sweden is the ducat, worth about 9s. ſterling. Of the ſilver currency, the crown is valued at 4s. 6d. ſterling; and the ſhelling at about 1d. of Engliſh money. The copper coinage conſiſts chiefly of half and quarter ſhellings; but formerly the copper money conſiſted of heavy pieces nearly as large as tiles, ſo that a cart or barrow was ſometimes required to carry home a moderate ſum that had been received in payment for merchandiſe. Theſe large pieces are now rarely ſeen.

191 Religion.

Chriſtianity was introduced into Sweden in the 9th century. Their religion is Lutheran, which was propagated among them by Guſtavus Vaſa about the year 1523. The Swedes are ſurpriſingly uniform and unremitting in religious matters; and have ſuch an averſion to Popery, that if a Roman Catholic prieſt be diſcovered in the country, he is treated with the greateſt indignity. The archbiſhop of Upſal had a revenue of 400l. a year, and had under him 13 ſuffragans with moderate ſtipends. No clergyman had the leaſt direction in the affairs of ſtate. Their morals, and the ſanctity of their lives, were ſuch as to endear them to the people. Their churches are neat, and often ornamented. A body of eccleſiaſtical laws and canons direct their religious economy. A converſion to Popery, or a long continuance under excommunication, which cannot paſs without the king's permiſſion, was puniſhment and exile.

192 Language and literature.

The language of Sweden is a dialect of the Gothic, and nearly allied to thoſe of Denmark, Norway, and Iceland. In the two grand diviſions of the Gothic, conſiſting of the German and Scandinavian dialects, the latter is diſtinguiſhed by greater brevity and force of expreſſion. In the ſouth of Sweden, which contains the chief maſs of population, ſome German and French words have been adopted; while the Dalecarlian, in the north-weſt, is eſteemed a peculiar dialect, perhaps only becauſe it contains more of the ancient terms and idiom.

In the antiquity of literature, Sweden cannot pretend to vie with Denmark, Norway, or Iceland; the moſt early native chronicle, or perhaps literary compoſition, being not more ancient than the 14th century. In return, while the Danes ſeem occupied with internal policy and public regulation, the Swedes have, in modern times, borne the palm of genius in many departments of literature and philoſophy.

But Swediſh literature can ſcarcely be ſaid to have dawned till the middle of the 17th century, when Queen Chriſtina, finding the country immerſed in ignorance, invited Grotius, Deſcartes, and other celebrated men, who, though they did not reſide long in the kingdom, ſowed the ſeed of letters, which gradually began to proſper in the wiſe and beneficent reign of Charles XI. In the ſucceeding or 18th century, the name of Linné alone might diſtinguiſh the national literature; and it is joined in natural hiſtory with thoſe of Scheele, Bergman, Tilas, Wallerius, Quiſt, Cronſtedt, and others. In hiſtory, Dalin and Lagerbring have diſtinguiſhed themſelves by a preciſion and force, which the Danes ſeem to ſacrifice to antiquarian diſcuſſions. Sweden alſo boaſts of native poets and orators; and the progreſs of the ſciences is ſupported by the inſtitution of numerous academies.

193 Produce and agriculture.

The Swedes, ſince the days of Charles XII. have been at incredible pains to correct the nature and barrenneſs of their country, by erecting colleges of agriculture, and in ſome places with great ſucceſs. Till of late, they had not ſufficient induſtry to remedy or improve the diſadvantages of their ſoil. The peaſants now follow the agriculture of France and England; and ſome late accounts ſay, that they rear almoſt as much grain as maintains the natives. Gothland produces wheat, rye, barley, oats, peaſe, and beans; and in caſes of deficiency, the people are ſupplied from Livonia and the Baltic provinces. In ſummer, the fields are verdant, and covered with flowers, and produce ſtrawberries, raſpberries, currants, and other ſmall fruits. The common

---

views of the emperors of the north and ſouth of Europe will ultimately deſtroy the ſmall remains of Swediſh independence.

Sweden.

common people know, as yet, little of the cultivation of apricots, peaches, nectarines, pine-apples; and other high-flavoured fruits; but melons are brought to the greateſt perfection in dry ſeaſons.

194 Manufactures and commerce.

The Swediſh commonalty ſubſiſts by agriculture, mining, hunting, grazing, and fiſhing. Their materials for traffic are the bulky and uſeful commodities of maſts, beams, and other kinds of timber for ſhipping; tar, pitch, bark of trees, potaſh, wooden utenſils, hides, flax, hemp, peltry, furs, copper, lead, iron, cordage, and fiſh.

Even the manufacturing of iron was introduced into Sweden ſo late as the 16th century; for till then they ſold their own crude ore to the Hanſe towns, and bought it back again manufactured into utenſils. About the middle of the 17th century they ſet up ſome manufactures of glaſs, ſtarch, tin, woollen, ſilk, ſoap, leather-dreſſing, and ſaw-mills. Bookſelling was at that time unknown in Sweden. They have ſince had ſugar making, tobacco plantations, and manufactures of ſail cloth, cotton, fuſtian, and other ſtuffs; alſo of linen, alum, brimſtone, paper-mills, and gunpowder-mills. The iron mine of Dannemora is ſaid to yield 60lbs. of metal in 100lbs. of ore, and others about 30lbs. The iron extracted from this is known in Europe by the name of *Oregrund*, which name is derived from a ſeaport on the Baltic. A large portion of it is employed by different nations for making the beſt ſteel. The mine was diſcovered in 1470. The unwrought ore was firſt ſold to the merchants of Lubeck. It is ſaid that the mine of Dannemora yields 40,000 ſtones of bar-iron per year, which is ſuppoſed to be $\frac{1}{10}$th of the quantity produced by all the iron-mines of Sweden. Of this product of 400,000 ſtones, 300,000 are annually exported, and the remainder is manufactured at home. It is computed that not fewer than 25,600 men are employed in mining, and the branches immediately connected with it, viz. 4000 for breaking the rocks; 10,800 for hewing timber and burning it into charcoal; 2000 are employed in ſmelting; 1800 in tranſporting the metal from the furnaces to the forges; 600 in tranſporting ſand, fuel, &c. 4000 for tranſporting the charcoal, and 2400 at forges. They have alſo founderies for cannon, manufactories for fire-arms and anchors, armories, wire and flatting mills, alſo mills for fulling, and for boring and ſtamping; and of late they have built many ſhips for ſale.

Certain towns in Sweden, 24 in number, are called *ſtaple-towns*, where the merchants are allowed to import and export commodities in their own ſhips. Thoſe towns which have no foreign commerce, though lying near the ſea, are called *land-towns*. A third kind are termed *mine-towns*, as belonging to mine diſtricts. About the year 1752, the Swedes had greatly increaſed their exports, and diminiſhed their imports, moſt part of which arrive or are ſent off in Swediſh ſhips; the Swedes having now a kind of navigation act like that of the Engliſh. According to the tables drawn up by Mr Coxe, the Swediſh exports amounted, about 30 years ago, to 1,368,830l. while the imports amounted to 1,008,391l. leaving a balance in favour of Sweden of 360,000l. The imports are chiefly corn, hemp, tobacco, ſugar, coffee, drugs, ſilk, wine, and brandy.

There is a great diverſity of characters among the people of Sweden; and what is peculiarly remarkable among them, they have been known to have different characters in different ages. At preſent, their peaſants ſeem to be a heavy plodding race of men, ſtrong and hardy, but without any other ambition than that of ſubſiſting themſelves and their families as well as they can: they are honeſt, ſimple, and hoſpitable; and the mercantile claſſes are much of the ſame caſt; but great application and perſeverance is diſcovered among them all. One could form no idea that the modern Swedes are the deſcendants of thoſe who, under Charles XII. and Guſtavus Adolphus, carried terror in their names through the moſt diſtant countries, and ſhook the foundations of the greateſt empires. The principal nobility and gentry of Sweden are naturally brave, polite, and hoſpitable; they have high and warm notions of honour, and are jealous of their national intereſts. The dreſs of the common people is almoſt the ſame with that of Denmark: the better ſort are infatuated with French modes and faſhions. The common diverſions of the Swedes are ſkating, running races in ſledges, and ſailing in yachts upon the ice. They are not fond of marrying their daughters when young, as they have little to ſpare in their own life-time. The women go to plough, threſh out the corn, row upon the water, ſerve the bricklayers, carry burdens, and do all the common drudgeries in huſbandry.

Sweden. Swedenborg.

195 Character of the Swedes.

SWEDENBORG, Emanuel, was born at Stockholm in Sweden, in January 1689. His father was biſhop of Weſt Gothland; member of a ſociety for the propagation of the goſpel, formed on the plan of that of England; and preſident of the Swediſh church in Pennſylvania and London. To this laſt office he was appointed by Charles XII. who ſeems to have had a great regard for the biſhop, and to have continued that regard to his ſon.

Of the courſe of young Swedenborg's education we have procured no account; but from the character of the father, it may be ſuppoſed to have been pious; and by his appearing with reputation as an author, when but 20 years of age, it is proved to have been ſucceſsful. His firſt work was publiſhed in 1709; and the year following he ſent into the world a collection of pieces on different ſubjects, in Latin verſe, under the title of *Ludus Heliconius, ſive Carmina Miſcellanea quæ variis in locis cecinit*. The ſame year he began his travels, firſt into England, afterwards into Holland, France, and Germany; and returning to Stockholm in 1714, he was two years afterwards appointed to the office of aſſeſſor in the Metallic College by Charles XII. who honoured him with frequent converſations, and beſtowed upon him a large ſhare of his favour. At this period of his life Swedenborg devoted his attention principally to phyſic and mathematical ſtudies; and in 1718 he accompanied the king to the ſiege of Frederickſhall, where he gave an eminent proof that he had not ſtudied in vain. Charles could not ſend his heavy artillery to Frederickſhall from the badneſs of the roads, which were then rendered much worſe than uſual by being deeply covered with ſnow. In this extremity Swedenborg brought the ſciences to the aid of valour. By the help of proper inſtruments he cut through the mountains, and raiſed the valleys which ſeparated Sweden from Norway, and then ſent to his maſter two galleys, five large boats, and a ſloop, loaded with battering pieces, to be employed in the ſiege. The length of this canal

Swedenborg.

canal was about two miles and a half. The execution of this great work, however, did not occupy all his time. In 1716 he had begun to publish essays and observations on the mathematical and physical sciences, under the title of *Dædalus Hyperboreus;* and he found leisure during the siege to complete his intended collection, and also in the same year to publish an introduction to algebra, under the whimsical title of *The Art of the Rules.*

At the siege of Frederickshall he lost his patron Charles; but found another in Ulrica Eleonora, the sister and successor of that hero, by whom in 1719 he was ennobled, and took of course his seat among the senators of the equestrian order in the triennial assemblies of the states. His promotion did not lessen his ardour for the sciences; for he published in the same year *A Method to fix the Value of Money, and to determine the Swedish Measures in such a way as to suppress all the Fractions and facilitate the Calculations.* About the same time he gave the public a treatise on *the Position and Course of the Planets;* with another on *the Height of the Tides, and Flux and Reflux of the Sea;* which, from information gathered in different parts of Sweden, appeared to have been greater formerly than when he wrote.

As Swedenborg continued, under the new sovereign, to hold the office of assessor to the Metallic College, he thought it necessary, for the discharge of his duty, to make a second journey into foreign countries, that he might himself examine their mines, particularly those of Saxony and Harts. During these travels, which were undertaken for the improvement of the manufactures of his native country, he printed at Amsterdam, 1. *Prodromus principiorum Naturalium, sive novorum tentaminum, Chemiam et Physicam experimentalem geometricè explicandi.* 2. *Nova observata et inventa circa Ferrum et Ignem, præcipue naturam Ignis Elementarum, una cum nova Camini inventione.* 3. *Methodus nova inveniendi Longitudines locorum terræ marique ope Lunæ.* 4. *Modus construendi receptacula navalia, vulgo en Suedois, Dockybynadder.* 5. *Nova constructio aggeris aquatici.* 6. *Modus explorandi virtutes Navigiorum.* And at Leipsic and Hamburg, 7. *Miscellanea observata circa res naturales, præsertim Mineralia, Ignem, et Montium strata.*

European Magazine, 1787, July.

This journey was made, and these tracts published, in the compass of a year and a half; and perhaps there has not been another man, Linnæus excepted, who has done so much in so short a time. After his return in 1722, Swedenborg divided his time so equally between the duties of his office and his private studies, that in 1733 he finished his grand work, entitled *Opera Philosophica et Mineralia*, and had it printed under his own direction in 1734, part at Dresden and part at Leipsic; in which year he also went to inspect the mines of Austria and Hungary. This work is divided into three volumes folio; the title of the first is *Principia rerum Naturalium sive novorum tentaminum, Phænomena Mundi elementaris philosophicè explicandi.* The second, *Regnum Subterraneum sive Minerale de Ferro;* and the third, *Regnum Subterraneum sive Minerale de Cupro, et Orichalco;* all of them written with great strength of judgement, and ornamented with plates, to facilitate the comprehension of the text.

In the year 1729 he was enrolled among the members of the Society of Sciences at Upsal, and was, probably about the same time, made a Fellow of the Royal Academy of Sciences at Stockholm; nor were strangers less willing than his own countrymen to acknowledge the greatness of his merit. Wolfius, with many other learned foreigners, was eager to court his correspondence. The Academy of St Petersburg sent him, on the 17th of December 1734, a diploma of association as a correspondent member; and soon afterwards the editors of the *Acta Eruditorum* at Leipsic found in his works a valuable supplement to their own collection.

Swedenborg.

By many persons the approbation of learned academies would have been highly valued; but by Baron Swedenborg it was considered as of very little importance. "Whatever of worldly honour and advantage may appear to be in the things before mentioned, I hold them (says he) but as matters of low estimation, when compared to the honour of that holy office to which the Lord himself hath called me, who was graciously pleased to manifest himself to me, his unworthy servant, in a personal appearance, in the year 1743, to open in me a sight of the spiritual world, and to enable me to converse with spirits and angels; and this privilege has continued with me to this day. From that time I began to print and publish various unknown *Arcana*, which have been either seen by me or revealed to me, concerning heaven and hell, the state of men after death, the true worship of God, the spiritual sense of the Scriptures, and many other important truths tending to salvation and true wisdom."

Short Account of the Honourable E. Swedenborg.

We shall not affront the understandings of our readers by making upon this account of the Baron's *call* such reflections as every person of a sound mind will make for himself; but it is rather remarkable, that a man who had devoted the better part of his life to the study of such sciences as generally fortify the mind against the delusions of fanaticism, and who had even excelled in these sciences, should have fallen into such a reverie as this. After this extraordinary call, the Baron dedicated himself wholly to the great work which, he supposed, was assigned him, studying diligently the word of God, and from time to time publishing to his fellow-creatures such important information as was made known to him concerning another world. Among his various discoveries concerning the spiritual world, one is, that it exists not in space. "Of this (says he) I was convinced, because I could there see Africans and Indians very near me, although they are so many miles distant here on earth; nay, that I could be made present with the inhabitants of other planets in our system, and also with the inhabitants of planets that are in other worlds, and revolve about other suns. By virtue of such presence (i. e. without real space), not of place, I have conversed with apostles, departed popes, emperors, and kings; with the late reformers of the church, Luther, Calvin, and Melancthon, and with others from distant countries."

Swedenborg's Universal Theology, vol. i. p. 87.

Notwithstanding the want of space in the spiritual world, he tells us, "that after death a man is so little changed that he even does not know but he is living in the present world; that he eats and drinks, and even enjoys conjugal delight as in this world; that the resemblance between the two worlds is so great, that in the spiritual world there are cities, with palaces and houses,

Ibid. N° 734.

Swedenborg.

houſes, and alſo writings and books, employments and merchandiſes; that there is gold, ſilver, and precious ſtones there. In a word (he ſays), there is in the ſpiritual world all and every thing that there is in the natural world, but that in heaven ſuch things are in an infinitely more perfect ſtate."

Such was his zeal in the propagation of theſe whimſical and ſometimes ſenſual doctrines, that he frequently left his native country to viſit diſtant cities, particularly London and Amſterdam, where all his theological works were printed at a great expence, and with little proſpect or probability of a reimburſement. "Wherever he reſided when on his travels, he was (ſays one of his admirers) a mere ſolitary, and almoſt inacceſſible, though in his own country of a free and open behaviour. He affected no honour, but declined it; purſued no worldly intereſt, but ſpent his time in travelling and printing, in order to communicate inſtruction and benefit to mankind. He had nothing of the preciſe in his manner, nothing of melancholy in his temper, and nothing in the leaſt bordering on enthuſiaſm in his converſation or writings." This is too much. We believe he was an inoffenſive viſionary; of his converſation we cannot judge; but the ſpecimens that we have given of his writings are frantic enthuſiaſm. He died at London, March 29th, in the year 1772; and after lying in ſtate, his remains were depoſited in a vault at the Swediſh church, near Radcliff-Highway.

Short Account, &c. p. 11. and *Harley's Preface to the Treatiſe on Influx.*

Though Baron Swedenborg's followers appear not to have been numerous during his life, they have increaſed ſince his death; and a ſect ſubſiſts at preſent in England which derives its origin from him, and is called *the New Jeruſalem Church.* The diſcriminating tenets of this ſect ſeem to be the following: "Holding the doctrine of one God, they maintain that this one God is no other than Jeſus Chriſt, and that he always exiſted in a human form; that for the ſake of redeeming the world, he took upon himſelf a proper human or material body, but not a human ſoul; that this redemption conſiſts in bringing the hells or evil ſpirits into ſubjection, and the heavens into order and regulation, and thereby preparing the way for a new ſpiritual church; that without ſuch redemption no man could be ſaved, nor could the angels retain their ſtate of integrity; that their redemption was effected by means of trials, temptations, or conflicts with evil ſpirits; and that the laſt of them, by which Chriſt glorified his humanity, perfecting the union of his divine with his human nature, was the paſſion of the croſs. Though they maintain that there is but one God, and one divine perſon, they hold that in this perſon there is a real Trinity; conſiſting of the divinity, the humanity, and the operation of them both in the Lord Jeſus; a Trinity which did not exiſt from all eternity, but commenced at the incarnation. They believe that the Scriptures are to be interpreted not only in a literal but in a ſpiritual ſenſe, not known to the world till it was revealed to B. Swedenborg; and that this ſpiritual ſenſe extends to every part of Scripture, except the Acts of the Apoſtles. They believe that there are angels attending upon men, reſiding, as B. Swedenborg ſays, in their affections; that temptation conſiſts in a ſtruggle between good and bad angels within men; and that by this means God aſſiſts men in theſe temptations, ſince of themſelves they could do nothing. Indeed B. Swedenborg maintains, that there is an univerſal influx from God into the ſouls of men, inſpiring them eſpecially with the belief of the divine unity. This efflux of divine light on the ſpiritual world he compares to the efflux of the light from the ſun in the natural world.

Prieſtley's Letters to the New Jeruſalem Church, p. 4, &c.

Swedenborg || Swift.

"There are (ſays B. Swedenborg) two worlds, the natural and the ſpiritual, entirely diſtinct, though perfectly correſponding to each other; that at death a man enters into the ſpiritual world, when his ſoul is clothed with a body, which he terms *ſubſtantial*, in oppoſition to the preſent *material* body, which, he ſays, is never to riſe out of the grave."

SWEEP, in the ſea-language, is that part of the mould of a ſhip where ſhe begins to compaſs in the rung-heads; alſo when the hauſer is dragged along the bottom of the ſea to recover any thing that is ſunk, they call this action *ſweeping for it.*

SWEET, in the wine trade, denotes any vegetable juice, whether obtained by means of ſugar, raiſins, or other foreign or domeſtic fruit, which is added to wines with a deſign to improve them.

SWEIN-MOT. See *FOREST Courts.*

SWERTIA, MARSH GENTIAN, a genus of plants belonging to the claſs pentandria, and in the natural ſyſtem ranging under the 20th order, *rotaceæ.* See BOTANY *Index.*

SWIETENIA, MAHOGANY, a genus of plants belonging to the claſs decandria, and in the natural ſyſtem arranged under the 54th order, *miſcellaneæ.* See BOTANY and MATERIA MEDICA *Index.*

The firſt uſe to which mahogany was applied in England, was to make a box for holding candles. Dr Gibbons, an eminent phyſician in the latter end of the 17th and beginning of the 18th century, had a brother, a Weſt India captain, who brought over ſome planks of this wood as ballaſt. As the Doctor was then building a houſe in King-ſtreet, Covent Garden, his brother thought they might be of ſervice to him. But the carpenters, finding the wood too hard for their tools, they were laid aſide for a time as uſeleſs. Soon after, Mrs Gibbons, wanting a candle-box, the Doctor called on his cabinet-maker to make him one of ſome wood that lay in his garden. Wollaſton, the cabinet-maker alſo complained that it was too hard. The Doctor ſaid he muſt get ſtronger tools. The candle-box was made and approved; inſomuch, that the Doctor then inſiſted on having a bureau made of the ſame wood, which was accordingly done; and the fine colour, poliſh, &c. were ſo pleaſing, that he invited all his friends to come and ſee it. Among them was the ducheſs of Buckingham. Her Grace begged ſome of the ſame wood of Dr Gibbons, and employed Wollaſton to make her a bureau alſo; on which the fame of mahogany and Mr Wollaſton was much raiſed, and things of this ſort became general.

SWIFT, DR JONATHAN, ſo univerſally admired as a wit and claſſical writer of the Engliſh language, was born in Dublin on November 30th 1667. His father was an attorney, and of a good family; but dying poor, the expence of his ſon's education was defrayed by his friends. At the age of ſix young Swift was ſent to the ſchool of Kilkenny, whence he was removed in his 15th year to Trinity College, Dublin.

In his academical ſtudies (ſays Dr Johnſon) he was either not diligent or not happy. The truth appears to be,

Swift.

be, that he despised them as intricate and useless. He told Mr Sheridan, his last biographer, that he had made many efforts, upon his entering the college, to read some of the old treatises on logic writ by Smeglesius, Keckermannus, Burgersdicius, &c. and that he never had patience to go through three pages of any of them, he was so disgusted at the stupidity of the work. When he was urged by his tutor to make himself master of this branch, then in high estimation, and held essentially necessary to the taking of a degree, Swift asked him, What it was he was to learn from those books? His tutor told him, The art of reasoning. Swift said, That he found no want of any such art; that he could reason very well without it; and that, as far as he could observe, they who had made the greatest proficiency in logic had, instead of the art of reasoning, acquired the art of wrangling; and instead of clearing up obscurities, had learned how to perplex matters that were clear enough before. For his own part, he was contented with that portion of reason which God had given him; and he would leave it to time and experience to strengthen and direct it properly; nor would he run the risk of having it warped or falsely biassed by any system of rules laid down by such stupid writers, of the bad effects of which he had but too many examples before his eyes in those reckoned the most acute logicians. Accordingly, he made a firm resolution, that he never would read any of those books; which he so pertinaciously adhered to, that though his degree was refused him the first time of sitting for it, on account of his not answering in that branch, he went into the hall a second time as ill prepared as before; and would also have been stopped a second time, on the same account, if the interest of his friends, who well knew the inflexibility of his temper, had not stepped in, and obtained it for him; though in a manner little to his credit, as it was inserted in the College Registry, that he obtained it *speciali gratia*, "by special favour;" where it remains upon record. But this circumstance is explained by others, that the favour was in consequence of Swift's distinguished talents.

"He remained in the college near three years after this, not through choice, but necessity, little known or regarded. By scholars he was reckoned a blockhead; and as the lowness of his circumstances would not permit him to keep company with persons of an equal rank with himself, upon an equal footing, he scorned to take up with those of a lower class, or to be obliged to those of a higher. He lived therefore much alone, and his time was employed in pursuing his course of reading in history and poetry, then very unfashionable studies for an academic; or in gloomy meditations on his unhappy circumstances. Yet, under this heavy pressure, the force of his genius broke out, in the first rude draught of the Tale of a Tub, written by him at the age of 19, though communicated to nobody but his chamber-fellow Mr Waryng; who, after the publication of the book, made no scruple to declare, that he had read the first sketch of it in Swift's hand-writing when he was of that age."

In 1688, being, by the death of Godwin Swift his uncle, who had chiefly supported him, left without subsistence, he went to consult his mother, who then lived at Leicester, about the future course of his life; and, by her direction, solicited the advice and patronage of Sir William Temple, whose father had lived in great friendship with Godwin Swift. Temple received him with great kindness, and was so much pleased with his conversation, that he detained him two years in his house, and recommended him to King William, who offered to make him a captain of horse. This not suiting his disposition, and Temple not having it quickly in his power to provide for him otherwise, Swift left his patron (1694) in discontent; having previously taken his master's degree at Oxford, by means of a testimonial from Dublin, in which the words of disgrace were omitted. He was resolved to enter into the church, where his first preferment was only 100l. a-year, being the prebend of *Kilroot* in *Conner;* which some time afterwards, upon Sir William Temple's earnestly inviting him back to his house at Moorpark, he resigned in favour of a clergyman far advanced in years and burdened with a numerous family. For this man he solicited the prebend, to which he himself inducted him.

In 1699 Swift lost his patron Sir William Temple, who left him a legacy in money, with the property of his manuscripts; and, on his death-bed, obtained for him a promise from the king of the first prebend that should become vacant at Westminster or Canterbury. That this promise might not be forgotten, Swift dedicated to the king the posthumous works with which he was entrusted, and for a while attended the court; but soon found his solicitations hopeless. He was then invited by the earl of Berkeley to accompany him into Ireland, where, after suffering some cruel disappointments, he obtained the livings of Laracor and Rathbeggin in the diocese of Meath; and soon afterwards invited over the unfortunate Stella, a young woman of the name of Johnson, whose life he contrived to embitter, and whose days, though he certainly loved her, we may confidently affirm, he shortened by his caprice.

This lady is generally believed to have been the daughter of Sir William Temple's steward; but her niece, a Mrs Hearn, assured Mr Berkeley, the editor of a volume of letters intitled *Literary Relics*, that her father was a merchant, and the youngest brother of a good family in Nottingham-shire; that her mother was the intimate friend of Lady Gifford, Sir William's sister; and that she herself was educated in the family with his niece, the late Mr Temple of Moorpark by Farnham *. This story would be intitled to the fullest credit, had not Mrs Hearn affirmed, in the same letter, that, before the death of Sir William Temple, Mrs Johnson's little fortune had been greatly injured by the South sea bubbles, which are known to have injured no person till the year 1720: (See COMPANY, II. 1.). When one part of a narrative is so palpably false, the remainder will always be received with hesitation. But whether Miss Johnson was the daughter of Temple's steward or of the friend of Lady Gifford, it is certain that Sir William left her 1000l.; and that, accompanied by Mrs Dingley, whose whole fortune amounted to an annuity of 27l. for life, she went, in consequence of Swift's invitation, to Laracor. With these two ladies he passed his hours of relaxation, and to them he opened his bosom; but they never resided in the same house, nor did he see either without a witness.

* See *Inquiry into the life of Dean Swift, prefixed to Literary Relics*, printed in 1789, for Elliot and Kay.

In 1701, Swift published *A Discourse of the Contests and Dissensions in Athens and Rome.* It was his first work, and indeed the only which he ever expressly acknowledged.

Swift.

knowledged. According to his conſtant practice he had concealed his name; but after its appearance, paying a viſit to ſome Iriſh biſhop, he was aſked by him if he had read that pamphlet, and what its reputation was in London. Upon his replying that he believed it was very well liked in London; "Very well liked!" ſaid the biſhop with ſome emotion. "Yes, Sir, it is one of the fineſt tracts that ever was written, and Biſhop Burnet is one of the beſt writers in the world." Swift, who always hated Burnet with ſomething more than political rancour, immediately queſtioned his right to the work, when he was told by the biſhop that he was "a young man;" and ſtill perſiſting to doubt of the juſtice of Burnet's claim, on account of the diſſimilarity of the ſtyle of the pamphlet from that of his other works, he was told that he was "a very poſitive young man," as no perſon in England but Biſhop Burnet was capable of writing it. Upon which Swift replied, with ſome indignation, I am to aſſure your lordſhip, however, that Biſhop Burnet did *not* write the pamphlet, for I wrote it myſelf. And thus was he forced in the heat of argument to avow what otherwiſe he would have for ever concealed.

Early in the enſuing ſpring King William died; and Swift, on his next viſit to London, found Queen Anne upon the throne. It was generally thought, upon this event, that the Tory party would have had the aſcendant; but, contrary to all expectation, the Whigs had managed matters ſo well as to get entirely into the queen's confidence, and to have the whole adminiſtration of affairs in their hands. Swift's friends were now in power; and the Whigs in general, knowing him to be the author of the Diſcourſe on the Conteſts, &c. which was written in defence of King William and his miniſters againſt the violent proceedings of the houſe of commons, conſidered themſelves as much obliged to him, and looked upon him as faſt to their party. But Swift thought with the Whigs only in the ſtate; for with reſpect to the church his principles were always thoſe of a Tory. He therefore declined any intimate connection with the leaders of the party, who at that time profeſſed what was called *low church principles*. But what above all ſhocked him, ſays Mr Sheridan, was their inviting Deiſts, Freethinkers, Atheiſts, Jews, and Infidels, to be of their party, under pretence of moderation, and allowing a general liberty of conſcience. As Swift was in his heart a man of true religion, he could not have borne, even in his private character, to have mixed with ſuch a motley crew. But when we conſider his principles in his political capacity, that he looked upon the church of England, as by law eſtabliſhed, to be the main pillar of our newly erected conſtitution, he could not, conſiſtently with the character of a good citizen, join with thoſe who conſidered it more as an ornament than a ſupport to the edifice; and could therefore look on with compoſure while it was undermining, or could even open the gate to a blind multitude, to try, like Sampſon, their ſtrength againſt it, and conſider it only as ſport. With ſuch a party, neither his religious nor political principles would ſuffer him to join; and with regard to the Tories, as is uſual in the violence of factions, they had run into oppoſite extremes, equally dangerous to the ſtate. He was therefore during the earlier part of the queen's reign of no party, but employed himſelf in diſcharging the duties of his function, and in publiſhing from time to time ſuch tracts as he thought might be uſeful. In the year 1704 he publiſhed the *Tale of a Tub*, which, conſidered merely as a work of genius, is unqueſtionably the greateſt which he ever produced; but the levity with which religion was thought to be there treated, raiſed up enemies to him among all parties, and eventually precluded him from a biſhopric. From that period till the year 1708, he ſeems to have employed himſelf in ſolitary ſtudy; but he then gave ſucceſſively to the public *The Sentiments of a Church of England man*, the ridicule of aſtrology under the name of *Bickerſtaff*, the *Argument againſt aboliſhing Chriſtianity*, and the defence of the *Sacramental Teſt*.

Soon after began the buſy and important part of Swift's life. He was employed (1710) by the primate of Ireland to ſolicit the queen for a remiſſion of the firſt fruits and twentieth parts to the Iriſh clergy. This introduced him to Mr Harley, afterwards earl of Oxford, who, though a Whig himſelf, was at the head of the Tory miniſtry, and in great need of an auxiliary ſo able as Swift, by whoſe pen he and the other miniſters might be ſupported in pamphlets, poems, and periodical papers. In the year 1710 was commenced the *Examiner*; of which Swift wrote 33 papers, beginning his firſt part of it on the 10th of November 1711. The next year he publiſhed *the Conduct of the Allies* ten days before the parliament aſſembled; and ſoon afterwards, *Reflections on the Barrier Treaty*. The purpoſe of theſe pamphlets was to perſuade the nation to a peace, by ſhowing that "mines had been exhauſted and millions deſtroyed" to ſecure the Dutch and aggrandize the emperor, without any advantage whatever to Great Britain. Though theſe two publications, together with his *Remarks on the Biſhop of Sarum's Introduction to the third Volume of his Hiſtory of the Reformation*, certainly turned the tide of popular opinion, and effectually promoted the deſigns of the miniſtry, the beſt preferment which his friends could venture to give him was the deanery of St Patrick's, which he accepted in 1713. In the midſt of his power and his politics he kept a journal of his viſits, his walks, his interviews with miniſters, and quarrels with his ſervant, and tranſmitted it to Mrs Johnſon and Mrs Dingley, to whom he knew that whatever befel him was intereſting: but in 1714 an end was put to his power by the death of the queen, which broke down at once the whole ſyſtem of Tory politics, and nothing remained for him but to withdraw from perſecution to his deanery.

In the triumph of the Whigs, Swift met with every mortification that a ſpirit like his could poſſibly be expoſed to. The people of Ireland were irritated againſt him beyond meaſure; and every indignity was offered him as he walked the ſtreets of Dublin. Nor was he inſulted by the rabble only; for perſons of diſtinguiſhed rank and character forgot the decorum of common civility to give him a perſonal affront. While his pride was hurt by ſuch indignities, his more tender feelings were alſo often wounded by baſe ingratitude. In ſuch a ſituation he found it in vain to ſtruggle againſt the tide that oppoſed him. He ſilently yielded to it, and retired from the world to diſcharge his duties as a clergyman, and attend to the care of his deanery. That no part of his time might lie heavy on his hands, he employed his leiſure hours on ſome hiſtorical attempts relating to the change of the miniſters and the conduct of the miniſtry; and

Swift.

and completed the hiſtory of the four laſt years of the queen, which had been begun in her lifetime, but which he never publiſhed. Of the work which bears that title, and is ſaid to be his, Dr Johnſon doubts the genuineneſs; and it certainly is not ſuch as we ſhould have expected from a man of Swift's ſagacity and opportunities of information.

In the year 1716 he was privately married to Mrs Johnſon by Dr Aſhe biſhop of Clogher; but the marriage made no change in their ſituation, and it would be difficult to prove (ſays Lord Orrery) that they were ever afterwards together but in the preſence of a third perſon. The dean of St Patrick's lived in a private manner, known and regarded only by his friends, till about the year 1720 that he publiſhed his firſt political pamphlet relative to Ireland, intitled *A Propoſal for the Univerſal Uſe of Iriſh Manufactures;* which ſo roufed the indignation of the miniſtry that they commenced a proſecution againſt the printer, and thus drew the attention of the public to the pamphlet, and at once made its author popular.

Whilſt he was enjoying the laurels which this work had wreathed for him, his felicity, as well as that of his wife, was interrupted by the death of Mrs Van Homrigh, and the publication of his poem called *Cadenus and Vaneſſa*, which brought upon him much merited obloquy. With Mrs Van Homrigh he became acquainted in London during his attendance at court; and finding her poſſeſſed of genius and fond of literature, he took delight in directing her ſtudies, till he got inſenſibly poſſeſſion of her heart. From being proud of his praiſe, ſhe grew fond of his perſon; and deſpiſing vulgar reſtraints, ſhe made him ſenſible that ſhe was ready to receive him as a huſband. She had wit, youth, beauty, and a competent fortune to recommend her; and for a while Swift ſeems to have been undetermined whether or not he ſhould comply with her wiſh. She had followed him to Ireland, where ſhe lived in a houſe about twelve miles diſtant from Dublin; and he continued to viſit her occaſionally, and to direct her ſtudies as he had done in London; but with theſe attentions ſhe was not ſatisfied, and at laſt ſent to him a letter written with great ardour and tenderneſs, inſiſting that he ſhould immediately accept or refuſe her as a wife. His anſwer, which probably contained the ſecret of his marriage, he carried himſelf; and having indignantly thrown it on the lady's table, inſtantly quitted the houſe, we believe without ſpeaking to her, and returned to Dublin to reflect on the conſequences of his own conduct. Theſe were dreadful. Mrs Van Homrigh ſurvived her diſappointment but a few weeks; during which time ſhe cancelled a will that ſhe had made in his favour, and ordered the poem to be publiſhed in which Cadenus had proclaimed her excellence and confeſſed his love.

His patriotiſm again burſt forth in 1724 to obſtruct the currency of Wood's halfpence; and his zeal was crowned with ſucceſs. Wood had obtained a patent to coin 180,000l. in halfpence and farthings for the kingdom of Ireland; and was about to turn his braſs into gold, when Swift, finding that the metal was debaſed to an enormous degree, wrote letters under the name of *M. B. Drapier* to ſhow the folly of giving gold and ſilver for coin not worth a third part of its nominal value. A proſecution was carried on againſt the printer; and Lord Carteret, then lord-lieutenant, iſſued a proclamation, offering 300l. for diſcovering the author of the fourth letter. The day after it was publiſhed there was a full levee at the caſtle. The lord-lieutenant was going round the circle, when Swift abruptly entered the chamber, and puſhing his way through the crowd, never ſtopped till he got within the circle; where, with marks of the higheſt indignation in his countenance, he addreſſed the lord-lieutenant with the voice of a Stentor, that re-echoed through the room, "So, my lord-lieutenant, this is a glorious exploit that you performed yeſterday, in iſſuing a proclamation againſt a poor ſhopkeeper, whoſe only crime is an honeſt endeavour to ſave his country from ruin. You have given a noble ſpecimen of what this devoted nation is to hope for from your government. I ſuppoſe you expect a ſtatue of copper will be erected to you for this ſervice done to Wood." He then went on for a long time, inveighing in the bitereſt terms againſt the patent, and diſplaying in the ſtrongeſt colours all the fatal conſequences of introducing that execrable coin. The whole aſſembly were ſtruck mute with wonder at this unprecedented ſcene. For ſome time a profound ſilence enſued. When Lord Carteret, who had liſtened with great compoſure to the whole ſpeech, made this fine reply, in a line of Virgil's:

Res dura, et regni novitas me talia cogunt
Moliri.

From this time Swift was known by the name of *the Dean*, and was acknowledged by the populace as the champion, patron, and inſtructor of Ireland.

In 1727 he returned to England; where, in conjunction with Pope, he collected three volumes of miſcellanies; and the ſame year he ſent into the world his *Gulliver's Travels*, a production which was read by the high and the low, and filled every reader with a mingled emotion of merriment and amazement. Whilſt he was enjoying the reputation of this work, he was ſuddenly called to a home of ſorrow. Poor Stella was ſinking into the grave; and after a languiſhing decay of about two months, died in her 44th year, on January 28. 1728. How much he wiſhed her life is ſhown by his papers; nor can it be doubted that he dreaded the death of her whom he loved moſt, aggravated by the conſciouſneſs that himſelf had haſtened it. With her vaniſhed all his domeſtic enjoyments, and of courſe he turned his thoughts more to public affairs; in the contemplation of which he could ſee nothing but what ſerved to increaſe the malady. The advances of old age, with all its attendant infirmities; the death of almoſt all his old friends; the frequent returns of his moſt diſpiriting maladies, deafneſs and giddineſs; and, above all, the dreadful apprehenſions that he ſhould outlive his underſtanding, made life ſuch a burden to him, that he had no hope left but a ſpeedy diſſolution, which was the object of his daily prayer to the Almighty.

The ſeverity of his temper increaſing, he drove his acquaintance from his table, and wondered why he was deſerted. In 1732, he complains, in a letter to Mr Gay, that "he had a large houſe, and ſhould hardly find one viſitor if he was not able to hire him with a bottle of wine:" and, in another to Mr Pope, "that he was in danger of dying poor and friendleſs, even his female friends having forſaken him; which," as he ſays, "vexed

Swift.

ed him moſt." Theſe complaints were afterwards repeated in a ſtrain of yet greater ſenſibility: "All my friends have forſaken me.

"*Vertiginoſus, inops, ſurdus, male gratus amicis.*

"Deaf, giddy, helpleſs, left alone,
"To all my friends a burden grown."

The fits of giddineſs and deafneſs to which he had been ſubjected from his boyiſh years, and for which he thought walking or riding the beſt remedy, became more frequent and violent as he grew old; and the preſentiment which he had long entertained of that wretchedneſs which would inevitably overtake him towards the cloſe of life, clouded his mind with melancholy and tinged every object around him. How miſerable he was rendered by that gloomy proſpect, we may learn from the following remarkable anecdote mentioned by Mr Faulkner in his letter to Lord Cheſterfield. "One time, in a journey from Drogheda to Navan, the dean rode before the company, made a ſudden ſtop, diſmounted from his horſe, fell on his knees, lifted up his hands, and prayed in the moſt devout manner. When his friends came up, he deſired and inſiſted on their alighting; which they did, and aſked him the meaning. "Gentlemen," ſaid he, "pray join your hearts in fervent prayers with mine, that I may never be like this oak-tree, which is decayed and withered at top, while the other parts are ſound." In 1736, while he was writing a ſatire called the *Legion Club* againſt the Iriſh parliament, he was ſeized with ſo dreadful a fit of his malady, that he left the poem unfiniſhed; and never after attempted a compoſition that required a courſe of thinking. From this time his memory gradually declined, his paſſions perverted his underſtanding, and, in 1741, he became utterly incapable of converſation; and it was found neceſſary to appoint legal guardians to his perſon and his fortune. He now loſt all ſenſe of diſtinction. His meat was brought to him cut into mouthfuls; but he would never touch it while the ſervant ſtaid; and at laſt, after it ſtood perhaps an hour, would eat it walking; for he continued his old habit, and was on his feet ten hours a-day. During next year a ſhort interval of reaſon enſuing, gave hopes of his recovery; but in a few days he ſunk into lethargic ſtupidity, motionleſs, heedleſs, and ſpeechleſs. After a year of total ſilence, however, when his houſekeeper told him that the uſual illuminations were preparing to celebrate his birth, he anſwered, "It is all folly; they had better let it alone." He at laſt ſunk into a perfect ſilence, which continued till the 29th of October 1745, when he expired without a ſtruggle, in his 78th year. The behaviour of the citizens on this occaſion gave the ſtrongeſt proof of the deep impreſſion he had made on their minds. Though he had been ſo many years to all intents and purpoſes dead to the world, and his departure from that ſtate ſeemed a thing rather to be wiſhed than deplored, yet no ſooner was his death announced, than they gathered from all quarters, and forced their way in crowds into the houſe, to pay the laſt tribute of grief to their departed benefactor. Nothing but lamentations were heard all around the quarter where he lived, as if he had been cut off in the vigour of his years. Happy were they who firſt got into the chamber where he lay, to procure, by bribes to the ſervants, locks of his hair, to be handed down as ſacred relics to their poſterity; and ſo eager were numbers to obtain at any price this precious memorial, that in leſs than an hour, his venerable head was entirely ſtripped of all its ſilver ornaments, ſo that not a hair remained. By his will, which was dated in May 1740, juſt before he ceaſed to be a reaſonable being, he left about 1200l. in ſpecific legacies; and the reſt of his fortune, which amounted to about 11,000l. to erect and endow an hoſpital for lunatics and idiots. He was buried in the moſt private manner, according to directions in his will, in the great aiſle of St Patrick's cathedral, and, by way of monument, a ſlab of black marble was placed againſt the wall, on which was engraved the following Latin epitaph, written by himſelf:

Hic depoſitum eſt corpus
JONATHAN SWIFT, S. T. P.
Hujus Eccleſiæ Cathedralis
Decani:
Ubi ſæva indignatio
Ulterius cor lacerare nequit.
Abi, viator,
Et imitare, ſi poteris,
Strenuum pro virili libertatis vindicem.
Obiit anno (1745)
Menſis (Octobris) die (29.)
Ætatis anno 78.

Swift undoubtedly was a man of native genius. His fancy was inexhauſtible; his conceptions were lively and comprehenſive; and he had the peculiar felicity of conveying them in language equally correct, free, and perſpicuous. His penetration was as quick as intuition; he was indeed the critic of nature; and no man ever wrote ſo much, and borrowed ſo little.

As his genius was of the firſt claſs, ſo were ſome of his virtues. The following anecdote will illuſtrate his filial piety. His mother died in 1710, as appears by a memorandum in one of the account-books which Dr Swift always made up yearly, and on each page entered minutely all his receipts and expences in every month, beginning his year from November 1. He obſerved the ſame method all his lifetime till his laſt illneſs. At the foot of that page which includes his expences of the month of May 1710, at the glebe houſe of Laracor in the county of Meath, where he was then reſident, are theſe remarkable words, which ſhow at the ſame time his filial piety, and the religious uſe which he thought it his duty to make of that melancholy event. "*Mem.* On Wedneſday, between ſeven and eight in the evening, May 10. 1710, I received a letter in my chamber at Laracor (Mr Percival and Jo. Beaumont being by) from Mrs F—, dated May 9, with one incloſed, ſent by Mrs Worral at Leiceſter to Mrs F—, giving an account that my dear mother, Mrs Abigail Swift, died that morning, Monday April 24 1710, about ten o'clock, after a long ſickneſs: being ill all winter, and lame; and extremely ill about a month or ſix weeks before her death. I have now loſt my barrier between me and death. God grant I may live to be as well prepared for it as I confidently believe her to have been! If the way to heaven be through piety, truth, juſtice, and charity, ſhe is there. J. S." He always treated his mother, during her life, with the utmoſt duty and affection; and ſhe ſometimes came to Ireland to viſit him after his ſettlement at Laracor.

The liberality of the dean hath been a topic of juſt

Swift.

encomium with all his admirers; nor could his enemies deny him this praiſe. In his domeſtic affairs, he always acted with ſtrict economy. He kept the moſt regular accounts; and he ſeems to have done this chiefly with a view to increaſe his power of being uſeful. "His income, which was little more than 700l. per annum, he endeavoured to divide into three parts, for the following purpoſes. Firſt, to live upon one-third of it. Secondly, to give another third in penſions and charities, according to the manner in which perſons who received them had lived: and the other third he laid by, to build an hoſpital for the reception of idiots and lunatics." "What is remarkable in this generous man, is this (ſays Mr F.), that when he lent money upon bond or mortgage, he would not take the legal intereſt, but one per cent. below it."

His charity appears to have been a ſettled principle of duty more than an inſtinctive effort of good nature: but as it was thus founded and ſupported, it had extraordinary merit, and ſeldom failed to exert itſelf in a manner that contributed moſt to render it beneficial. He did not laviſh his money on the idle and the worthleſs. He nicely diſcriminated characters, and was ſeldom the dupe of impoſition. Hence his generoſity always turned to an uſeful account; while it relieved diſtreſs, it encouraged induſtry, and rewarded virtue. We dwell with great pleaſure on this truly excellent and diſtinguiſhing part of the dean's character: and for the ſake of his charity we can overlook his oddities, and almoſt forgive his faults. He was a very peculiar man in every reſpect. Some have ſaid, "What a man he would have been, had he been without thoſe whims and infirmities which ſhaded both his genius and his character!" But perhaps the peculiarities complained of were inſeparable from his genius. The vigour and fertility of the root could not fail now and then of throwing out ſuperfluous ſuckers. What produced theſe, produced alſo the more beautiful branches, and gave the fruit all its richneſs.

It muſt be acknowledged, that the dean's fancy hurried him into great abſurdities and inconſiſtencies, for which nothing but his extraordinary talents and noble virtues, diſcovered in other inſtances, could have atoned. The rancour he diſcovered on all occaſions towards the diſſenters is totally unjuſtifiable. No ſect could have merited it in the degree in which he always ſhowed it to them; for, in ſome inſtances, it bordered on downright perſecution. He doubtleſs had his reaſons for expoſing their principles to ridicule, and might perhaps have ſufficient grounds for ſome of his accuſations againſt their principal leaders in Ireland; but nothing could juſtify his virulence againſt the whole body. In a ſhort poem on one claſs of diſſenters he beſtowed a ſtricture upon Betteſworth, a lawyer eminent for his inſolence to the clergy, which, from a very conſiderable reputation, brought him into immediate and univerſal contempt. Betteſworth, enraged at his diſgrace and loſs, went to the dean, and demanded whether he was the author of that poem? "Mr Betteſworth (anſwered he), I was in my youth acquainted with great lawyers, who, knowing my diſpoſition to ſatire, adviſed me, if any *ſcoundrel* or *blockhead* whom I had lampooned ſhould aſk, 'Are you the author of this paper?' to tell him that I was not the author; and therefore, I tell *you*, Mr Betteſworth, that I am not the author of theſe lines."

Swift.

Swift has been accuſed of irreligion and miſanthropy, on account of his Tale of a Tub, and his Yahoos in Gulliver's Travels; but both charges ſeem to be ill-founded, or at leaſt not ſupported by that evidence. The *Tale of a Tub* holds up to ridicule ſuperſtitious and fanatical abſurdities; but it never attacks the eſſentials of religion: and in the ſtory of the *Yahoos*, diſguſting we confeſs, there appears to us as little evidence that the author hated his own ſpecies, as in the poems of *Strephon and Chloe*, and the *Ladies Dreſſing Room*, that he approved of groſſneſs and filth in the female ſex. We do not indeed, with his fondeſt admirers, perceive the moral tendency of the Voyage to the Houyhnhnms, or conſider it as a ſatire admirably calculated to reform mankind; but neither do we think that it can poſſibly corrupt them, or lead them to think meanly of their rational nature. According to Sheridan, "the deſign of this apologue is to place before the eyes of man a picture of the two different parts of his frame, detached from each other, in order that he may the better eſtimate the true value of each, and ſee the neceſſity there is that the one ſhould have an abſolute command over the other. In your merely animal capacity, ſays he to man, without reaſon to guide you, and actuated only by a blind inſtinct, I will ſhow you that you would be degraded below the beaſts of the field. That very form, that very body, you are now ſo proud of, as giving you ſuch a ſuperiority over all other animals, I will ſhow you, owe all their beauty, and all their greateſt powers, to their being actuated by a rational ſoul. Let that be withdrawn, let the body be inhabited by the mind of a brute, let it be prone as theirs are, and ſuffered like theirs to take its natural courſe, without any aſſiſtance from art, you would in that caſe be the moſt deformed, as to your external appearance, the moſt deteſtable of all creatures. And with regard to your internal frame, filled with all the evil diſpoſitions and malignant paſſions of mankind, you would be the moſt miſerable of beings, living in a continued ſtate of internal vexation, and of hatred and warfare with each other.

"On the other hand, I will ſhow another picture of an animal endowed with a rational ſoul, and acting uniformly up to the dictates of right reaſon. Here you may ſee collected all the virtues, all the great qualities, which dignify man's nature, and conſtitute the happineſs of his life. What is the natural inference to be drawn from theſe two different repreſentations? Is it not evidently a leſſon to mankind, warning them not to ſuffer the animal part to be predominant in them, leſt they reſemble the vile Yahoo, and fall into vice and miſery; but to emulate the noble and generous Houyhnhnm, by cultivating the rational faculty to the utmoſt; which will lead them to a life of virtue and happineſs."

Such *may* have been the author's intention; but it is not ſufficiently obvious to produce the proper effect, and is indeed hardly conſiſtent with that incapability under which he repreſents the Yahoos of ever acquiring, by any culture, the virtues of the noble Houyhnhnms.

With reſpect to his religion, it is a fact unqueſtionable, that while the power of ſpeech remained, he continued conſtant in the performance of his private devotions; and in proportion as his memory failed, they were

Swift.

were gradually ſhortened, till at laſt he could only repeat the Lord's prayer, which he continued to do till the power of utterance for ever ceaſed. Such a habit as this could not have been formed but by a man deeply impreſſed with a conviction of the truth and importance of revelation.

The moſt inexcuſable part of Swift's conduct is his treatment of Stella and Vaneſſa, for which no proper apology can be made, and which the vain attempts of his friends have only tended to aggravate. One attributes his ſingular conduct to a peculiarity in his conſtitution; but if he knew that he was incapable of fulfilling the duties of the married ſtate, how came he to tie one of the ladies to himſelf by the marriage ceremony, and in the moſt explicit terms to declare his paſſion to the other? And what are we to think of the ſenſibility of a man who, ſtrongly attached as he ſeems to have been to both, could, without ſpeaking, fling a paper on the table of the one, which "proved (as our author expreſſes it) her death-warrant," and could throw the other, his beloved Stella, in her laſt illneſs, into unſpeakable agonies, and "never ſee her more, for only adjuring him, by their friendſhip, to let her have the ſatisfaction of dying at leaſt, though ſhe had not lived, his acknowledged wife?" Another apologiſt inſinuates, upon ſomething like evidence, that Stella bore a ſon to Swift, and yet labours to excuſe him for not declaring her his wife, becauſe ſhe had agreed at the marriage that it ſhould remain a ſecret from all the world unleſs the diſcovery ſhould be called for by *urgent neceſſity*; but what could be meant by the term *urgent neceſſity*, unleſs it alluded to the birth of children, he confeſſes that it would be hard to ſay. The truth we believe to be what has been ſaid by Johnſon, that the man whom Stella had the misfortune to love was fond of ſingularity, and deſirous to make a mode of happineſs for himſelf, different from the general courſe of things and the order of Providence; he wiſhed for all the pleaſures of perfect friendſhip, without the uneaſineſs of conjugal reſtraint. But with this ſtate poor Stella was not ſatisfied; ſhe never was treated as a wife, and to the world ſhe had the appearance of a miſtreſs. She lived ſullenly on, hoping that in time he would own and receive her. This, we believe, he offered at laſt to do, but not till the change of his manners and the depravation of his mind made her tell him, that "it was too late."

The natural acrimony of Swift's temper had been increaſed by repeated diſappointments. This gave a ſplenetic tincture to his writings, and amidſt the duties of private and domeſtic life it too frequently appeared to ſhade the luſtre of his more eminent virtues.—The dean hath been accuſed of avarice, but with the ſame truth as he hath been accuſed of infidelity. In detached views, no man was more liable to be miſtaken. Even his genius and good ſenſe might be queſtioned, if we were only to read ſome paſſages of his writings. To judge fairly and pronounce juſtly of him as a man and as an author, we ſhould examine the uniform tenor of his diſpoſition and conduct, and the general nature and deſign of his productions. In the latter he will appear great, and in the former good; notwithſtanding the puns and puerilities of the one, and the abſurdities and inconſiſtencies of the other.

SWIFT, a ſpecies of ſwallow. See HIRUNDO, ORNITHOLOGY *Index*.

Swimming.

SWIMMING, the art of ſuſpending one's ſelf on water, and at the ſame time making a progreſſive motion through it.

1 Swimming not natural to man.

As ſwimming is not natural to man, it is evident that at ſome period it muſt have been unknown among the human race. Nevertheleſs there are no accounts of its origin to be found in the hiſtory of any nation; nor are there any nations ſo barbarous but that the art of ſwimming is known among them, and that in greater perfection than among civilized people. It is probable, therefore, that the art, though not abſolutely natural, will always be acquired by people in a ſavage ſtate from imitating the brute animals, moſt of whom ſwim naturally. Indeed ſo much does this appear to be the caſe, that very expert ſwimmers have recommended it to thoſe who wiſhed to learn the art, to keep ſome frogs in a tub of water conſtantly beſide them, and to imitate the motions by which they move through that element.

2 Depends on a ſimple principle.

The theory of ſwimming depends upon one very ſimple principle; namely, that if a force be applied to any body, it will always move towards that ſide where there is the leaſt reſiſtance. Thus, if a perſon ſtanding in a boat puſhes with a pole againſt the ſide or any other part of the veſſel in which he ſtands, no motion will enſue; for as much as he preſſes in one direction with the pole, juſt ſo much does the action of his feet, on which the preſſure of the pole muſt ultimately reſt, puſh the veſſel the other way: but if, inſtead of the ſide of the veſſel, he puſhes the pole againſt the ſhore, then only one force acts upon it, namely, that of the feet; which being reſiſted only by the fluid water, the boat begins to move from the ſhore. Now the very ſame thing takes place in ſwimming, whether the animal be man, quadruped, bird, or fiſh. If we conſider the matter ſimply, we may ſuppoſe an animal in ſuch a ſituation that it could not poſſibly ſwim: thus, if we cut off the fins and tail of a fiſh, it will indeed float in conſequence of being ſpecifically lighter than the water, but cannot make any progreſſive motion, or at leaſt but very little, in conſequence of wriggling its body; but if we allow it to keep any of its fins, by ſtriking them againſt the water in any direction, the body moves the contrary way, juſt as a boat moves the contrary way to that in which the oars ſtrike the water. It is true, that as the boat is but partly immerged in the water, the reſiſtance is comparatively leſs than when a frog or even any other quadruped ſwims; but a boat could certainly be rowed with oars though it was totally immerged in water, only with leſs velocity than when it is not. When a man ſwims, he in like manner ſtrikes the water with his hands, arms, and feet; in conſequence of which the body moves in a direction contrary to the ſtroke. Upon this principle, and on this only, a man may either aſcend, deſcend, or move obliquely in any poſſible direction, in the water. One would think, indeed, that as the ſtrength of a man's arms and legs is but ſmall, he could make but very little way by any ſtroke he could give the water, conſidering the fluidity of that element. Nevertheleſs it is incredible what expert ſwimmers will perform in this way; of which Mr Forſter gives a moſt remarkable inſtance in the inhabitants of Otaheite; whoſe agility, he tells us, was ſuch, that when a nail was thrown overboard, they would jump after it into the ſea, and never fail to catch it before it reached to the bottom.

As to the practice of ſwimming, there are but few directions

Swimming. directions which can be given. The great obſtacle is the natural dread which people have of being drowned; and this it is impoſſible to overcome by any thing but accuſtoming ourſelves to go into the water. With regard to the real danger of being drowned, it is but little; and on innumerable occaſions ariſes entirely from the terror above mentioned, as will appear from the following obſervations by Dr Franklin.

3 Obſervations by Dr Franklin.

"1ſt, That though the legs, arms, and head, of a human body, being ſolid parts, are ſpecifically ſomewhat heavier than freſh water, yet the trunk, particularly the upper part, from its hollowneſs, is ſo much lighter than water, as that the whole of the body, taken together, is too light to ſink wholly under water, but ſome part will remain above until the lungs become filled with water; which happens from drawing water into them inſtead of air, when a perſon in the fright attempts breathing while the mouth and noſtrils are under water.

"2dly, That the legs and arms are ſpecifically lighter than ſalt water, and will be ſupported by it; ſo that a human body would not ſink in ſalt water though the lungs were filled as above, but from the greater ſpecific gravity of the head.

"3dly, That therefore a perſon throwing himſelf on his back in ſalt water, and extending his arms, may eaſily lie ſo as to keep his mouth and noſtrils free for breathing; and by a ſmall motion of his hands may prevent turning, if he ſhould perceive any tendency to it.

4thly, That in freſh water, if a man throws himſelf on his back near the ſurface, he cannot long continue in that ſituation, but by a proper action of his hands on the water. If he uſes no ſuch action, the legs and lower part of the body will gradually ſink till he comes into an upright poſition; in which he will continue ſuſpended, the hollow of the breaſt keeping the head uppermoſt.

5thly, But if in this erect poſition the head is kept upright above the ſhoulders, as when we ſtand on the ground, the immerſion will, by the weight of that part of the head that is out of the water, reach above the mouth and noſtrils, perhaps a little above the eyes; ſo that a man cannot long remain ſuſpended in water with his head in that poſition.

"6thly, The body continued ſuſpended as before, and upright, if the head be leaned quite back, ſo that the face looks upwards, all the back part of the head being then under water, and its weight conſequently in a great meaſure ſupported by it, the face will remain above water quite free for breathing, will riſe an inch higher every inſpiration, and ſink as much every expiration, but never ſo low as that the water may come over the mouth.

"7thly, If therefore a perſon unacquainted with ſwimming, and falling accidentally into the water, could have preſence of mind ſufficient to avoid ſtruggling and plunging, and to let the body take this natural poſition, he might continue long ſafe from drowning, till perhaps help would come; for as to the clothes, their additional weight while immerſed is very inconſiderable, the water ſupporting it; though when he comes out of the water, he would find them very heavy indeed."

4 His method of learning to ſwim.

The method of learning to ſwim is as follows: The perſon muſt walk into water ſo deep that it will reach to the breaſt. He is then to lie down gently on the belly, keeping the head and neck perfectly upright, the breaſt advancing forward, the thorax inflated, and the back bent; then withdrawing the legs from the bottom, and ſtretching them out, ſtrike the arms forwards in uniſon with the legs. Swimming on the back is ſomewhat ſimilar to that on the belly; but with this difference, that although the legs are employed to move the body forwards, the arms are generally unemployed, and the progreſſive motion is derived from the movement of the legs. In diving, a perſon muſt cloſe his hands together, and, preſſing his chin upon his breaſt, make an exertion to bend with force forwards. While in that poſition, he muſt continue to move with rapidity under the ſurface; and whenever he chooſes to return to his former ſituation, he has nothing to do but bend back his head, and he will immediately return to the ſurface.

It is very common for novices in the art of ſwimming to make uſe of corks or bladders to aſſiſt in keeping the body above water. Some have utterly condemned the uſe of theſe; however, Dr Franklin allows that they may be of ſervice for ſupporting the body while one is learning what is called the *ſtroke*, or that manner of drawing in and ſtriking out the hands and feet that is neceſſary to produce progreſſive motion. "But (ſays he) you will be no ſwimmer till you can place confidence in the power of the water to ſupport you: I would therefore adviſe the acquiring that confidence in the firſt place, eſpecially as I have known ſeveral who, by a little of the practice neceſſary for that purpoſe, have inſenſibly acquired the ſtroke, taught as it were by nature.

5 and of acquiring confidence.

"The practice I mean is this: Chooſing a place where the water deepens gradually, walk coolly into it till it is up to your breaſt: then turn round your face to the ſhore, and throw an egg into the water, between you and the ſhore; it will ſink to the bottom, and be eaſily ſeen there, if the water is clear. It muſt lie in the water ſo deep as that you cannot reach it to take it up but by diving for it. To encourage yourſelf in order to do this, reflect that your progreſs will be from deeper to ſhallower water; and that at any time you may, by bringing your legs under you, and ſtanding on the bottom, raiſe your head far above the water: then plunge under it with your eyes open, throwing yourſelf towards the egg, and endeavouring, by the action of your hands and feet againſt the water, to get forward till within reach of it. In this attempt you will find that the water buoys you up againſt your inclination; that it is not ſo eaſy a thing to ſink as you imagined; that you cannot but by active force get down to the egg. Thus you feel the power of the water to ſupport you, and learn to confide in that power; while your endeavours to overcome it, and to reach the egg, teach you the manner of acting on the water with your feet and hands; which action is afterwards uſed in ſwimming to ſupport your head higher above water, or to go forward through it."

6 Swimming a pleaſant and uſeful exercise

As ſwimming is a healthy exercise and a pleaſant amuſement, and as a dexterity in it may frequently put it in a man's power to ſave his own life and the lives of his fellow-creatures, perhaps of his deareſt friends, it can neither be uſeleſs nor uninteresting to consider a few of the evolutions which a ſwimmer muſt be maſter of, that he move in any direction without difficulty, without danger, and without being unneceſſarily fatigued.

There

Swimming.

7 How to turn to the right or left.

There are ſeveral different ways of turning one's ſelf in ſwimming. You may do it in this way: Turn the palm of the right hand outwards, extend the arm in the ſame manner, and make a contrary movement with the left hand and left arm; then, by a gradual motion, incline your head and whole body to the left ſide, and the evolution will be finiſhed. There is another way which is eaſier ſtill: Bend your head and body toward that ſide to which you are going to turn. If you wiſh to turn to the left, incline the thumb and the right hand toward the bottom, bend the fingers of the right hand, ſtretch it out, and uſe it for driving away the water ſidewiſe, or, which is the ſame thing, for puſhing yourſelf the contrary way. At the ſame time, with your left hand, the fingers being cloſe, puſh the water behind you, and all at once turn your body and your face to the left, and the manœuvre will be accompliſhed. If you wiſh to turn to the right, you muſt do with your right hand what you did with your left, and with your left what you did with your right. You muſt be careful when turning yourſelf never to ſtretch out your legs, and be ſure that the water be ſo deep that you be in no danger of hurting yourſelf.

8 How to turn from the belly to the back.

When you are ſwimming on your belly, and wiſh to turn on your back, draw your feet in quickly, and throw them before you; ſtretch out your hands behind you, and keep your body firm and ſteady. When you wiſh to turn from ſwimming on your back, fold your feet at once under your body as if you were throwing them to the bottom, and at the ſame inſtant dart your body forwards, that you may fall upon your belly.

9 The eyes ought to be turned towards heaven.

In ſwimming, the eyes ought to be turned towards heaven. This is a moſt important rule, and to the neglect of it many of the accidents which befal ſwimmers are owing. For when they bend their eyes downwards, they inſenſibly bend their head too, and thus the mouth being too deep in the water, may admit a quantity of it in breaking; beſides, the more the body is ſtretched, it covers a greater part of the ſurface of the water, and conſequently its ſpecific gravity is leſs. Any perſon who will make the experiment will find it impoſſible to dive while he keeps his head erect and his eyes fixed on the heavens (A).

10 How to ſwim on the back.

The eaſieſt poſture in ſwimming is lying on the back. When you wiſh to ſwim in this poſture, lay yourſelf ſoftly on your back, and raiſe your breaſt to the ſurface of the water, keeping your body extended in the ſame line. Put your hands eaſily over the upper part of your thighs, and throw out your legs and draw them in alternately, keeping them within two feet of the ſurface. In this way you may advance in any direction you pleaſe. You may perhaps not like having ſo much of your head under water; there is, however, no way of ſwimming ſo eaſy, ſo ſafe, and ſo little fatiguing. If you wiſh to ſwim with great rapidity, you may uſe your arms as well as your feet; and you will find this the eaſieſt way of breaking the force of the waves.

11 and advance forwards.

In ſwimming on the back, one may advance forward as well as backward. For this purpoſe the body muſt be kept ſtraight and extended; the breaſt inflated, ſo that the hollow of the back may aſſume a ſemicircular form. The hands muſt recline over the upper parts of the thighs. It is alſo neceſſary to raiſe the legs one after another, and draw them in ſtrongly towards the hams, and then leave them ſuſpended in the water. This way of ſwimming is not only pleaſant, but may ſerve to reſt you when fatigued.

12 How to ſwim on one ſide.

When you are tired with ſwimming on your back and belly, you may ſwim on one ſide. When you wiſh to do this, ſink a little your left ſide and raiſe your right; you will immediately find yourſelf on your left ſide. Move then your left hand without either raiſing or ſinking it; you have only to ſtretch it and draw it back, as in a ſtraight line, on the ſurface of the water. Independent of the pleaſure which this kind of motion will give you, you will have the ſatisfaction of ſeeing both ſides of the river.

13 How to ſwim on the belly without the aſſiſtance of the hands.

It is poſſible to ſwim on the belly without the aſſiſtance of the hands. For this purpoſe you muſt keep your breaſt erect, your neck ſtraight, and fix your hands behind your head, or upon your back, while you move forward by employing your feet. This way is not without its advantages. It is an excellent reſource when the arms are ſeized with a cramp, or with any indiſpoſition which makes it painful to exert them. This in ſome caſes may be preferable to ſwimming on the back; for while in that attitude, one cannot ſee before them without turning every inſtant. If one of your legs be ſeized with a cramp, take hold of it with the hand oppoſite to it, and uſe the other hand and leg to advance or ſupport yourſelf.

14 How to ſwim with the hands joined.

A very ancient and graceful mode of ſwimming, is that of ſwimming with the hands joined. When you wiſh to put this in practice, join your hands, keeping the thumbs and fingers towards heaven, ſo that they may appear above the water; then draw them back and puſh them forwards alternately from your breaſt. This method of ſwimming may be uſeful in ſeveral circumſtances, but above all if you are entangled with graſs or weeds. Your hands will then open a paſſage for you.

15 With the hands elevated.

As a perſon may ſometimes have occaſion to carry ſomething in his hand in ſwimming, which he is anxious to preſerve from the water, he may ſwim eaſily with one hand and hold a parcel in the other, as Cæſar ſwam with his Commentaries at Alexandria; or one may ſwim with both hands elevated. To perform this well, the ſwimmer muſt raiſe his breaſt, and keep it as much inflated as

(A) An intereſting queſtion occurs here, which deſerves to be conſidered. Since the body, when ſpread upon the ſurface, can be ſupported with ſo little exertion, and frequently without any at all, as in ſwimming on the back, how comes it to paſs that a perſon when drowned ſinks and frequently riſes again ſome time afterwards? The reaſon is this: In the act of drowning, the lungs are filled with water, and conſequently the body, being ſpecifically heavier, ſinks. It is well known that the human body contains a great quantity of air: this air is at firſt compreſſed by the water; and while this is the caſe the body remains at the bottom: but as ſoon as the air by its elaſticity endeavours to diſengage itſelf from the compreſſion, the body is ſwelled and expanded, becomes ſpecifically lighter than the water, and conſequently riſes to the top.

Swimming || Switzerland.

as he can, at the ſame time that he ſupports the arms above the water. It muſt not be concealed, that this method of ſwimming is attended with ſome danger to one who is not dexterous at the art; for if one ſhould imprudently draw in his breaſt, when his arms are raiſed, he would immediately ſink to the bottom.

16 How to riſe to the ſurface after diving.

When a man plunges into the water, and has reached the bottom, he has only to give a ſmall ſtroke with his foot againſt the ground, in order to riſe; but an experienced ſwimmer, if he miſſes the ground, has recourſe to another expedient, which is very pretty, and which has not been much conſidered. Suppoſe him at a conſiderable depth, when he perceives that he cannot reach the bottom. In ſuch a caſe, he firſt puts his hands before his face, at the height of his forehead, with the palms turned outwardly; then holding the fore part of his arm vertically, he makes them move backwards and forwards from right to left; that is to ſay, theſe two parts of his arms, having the elbow as a kind of pivot, deſcribe very quickly, both the hands being open, and the fingers joined, two ſmall portions of a circle before the forehead, as if he would make the water retire, which he in fact does; and from theſe ſtrokes given to the water, there reſults an oblique force, one part of which carries the ſwimmer upwards.

There are many artificial methods of ſupporting one's ſelf in water, but we have not room to deſcribe them.—Thoſe who wiſh to ſee a full account of them may conſult the *Encyclopédie Methodique*.

SWIMMING of Fiſh. A great proportion of the inhabitants of the waters have an air-bladder, by which they poiſe themſelves. Their movements chiefly depend upon their tail. See ANATOMY, Part II.; and ICHTHYOLOGY.

SWINDLER, a word which has been lately adopted into the Engliſh language, derived from the German word *ſchwindel*, "to cheat." Swindling has now become ſo common in ſeveral of the great towns of this country, that it is unfortunately too well known to require any deſcription.

SWINE. See SUS, MAMMALIA *Index*.

SWINE-Stone. See MINERALOGY *Index*.

SWINGING, a kind of exerciſe ſtrongly recommended to perſons in conſumption by ſome phyſicians, and diſapproved of by others. See MEDICINE *Index*.

SWING-TREE of a waggon, is the bar faſtened acroſs the fore-guide, to which the traces of the horſes are faſtened.

SWING-Wheel, in a royal pendulum, that wheel which drives the pendulum. In a watch or balance clock it is called the crown-wheel.

SWINGLE, in the fireworks in England, the wooden ſpoke which is fixed to the barrel that draws the wire, and which, by its being forced back by the cogs of the wheel, is the occaſion of the force with which the barrel is pulled.

SWITZ, or SCHWEITS, the capital of one of the cantons of Switzerland, to which it gives name, ſeated on the eaſt ſide of the lake Lucerne, in N. Lat. 46. 55. E. Long. 8. 30.

1 Situation.

SWISSERLAND, or SWITZERLAND, a mountainous diſtrict of the ſouth of Europe, which at the latter end of the 18th century, formed a republic compoſed of ſeveral independent ſtates or cantons, but which may now be regarded as a province of France.

Switzerland.

Switzerland is bounded on the north and eaſt by Germany, on the ſouth by Italy, and on the weſt by the departments of the Higher and Lower Alps, and the mouths of the Rhone. Its extent from eaſt to weſt is computed at about 200 Britiſh miles, and its breadth from north to ſouth at about 130 Britiſh miles. Its contents in ſquare miles are eſtimated at 14,960.

2 Boundaries and extent.

3 Diviſion.

Before it was reduced to the condition of a French province, Switzerland contained 13 independant cantons, and a number of ſmall diſtricts, which were dependent on the cantons. The independent cantons were, 1. Berne, including the *Pays de Vaud*; 2. FRIBURG; 3. BASIL; 4. SOLEURE; 5. SCHAFFHAUSEN; 6. ZURICH; 7. APPENZEL; 8. LUCERNE; 9. ZUG; 10. SCHWEITZ; 11. UNDERWALDEN; 12. URI; 13. GLARIS. The diſtricts dependent on theſe cantons were, the principality of *Neufchatel*; the biſhopric of *Baſil*; county of *Baden*; the free *Baillages*; *Turgovia*; *Tokenburg*; the *Rheinthal*; lands of the Abbey of *St Gal*; country of the *Griſons*; *Valteline*; Italian *Baillages*; the *Vallais*. Since its ſubjection to France, the country has been divided into the following 19 cantons; viz. Appenzel, Argovia, Baſil, Friburg, Glaris, Griſons, Lucerne, St Gal, Schaffhauſen, Schweitz, Soleure, Teſſin, Thurgovia, Underwald, Uri, Vaud, Zug, and Zurich. An account of the moſt important of theſe cantons, and of their capitals, will be found under their proper heads in this work.

4 Air, ſoil, produce, &c.

With reſpect to the air, ſoil, and produce, that part of the canton of Berne to the eaſt of the lake of Geneva, together with the cantons of Uri, Schweitz, Underwalden, Glaris, and Appenzel, and part of the canton of Lucerne, conſiſt of ſtupendous mountains, whoſe ſummits are ſaid to be from 9000 to 12000 feet above the level of the ſea, conſiſting of inacceſſible rocks, of which ſome are quite bare, while others are always covered with ice and ſnow. Among the mountains are many excellent medicinal and other ſprings, cold and warm baths, water-falls, precipices, deep narrow valleys, and caverns. The higheſt are thoſe in the canton of Uri. Many of the valleys are covered with lakes, or watered by brooks and rivers.

In ſome of them are towns, villages, woods, vineyards, and corn-lands. Both on the mountains and in the valleys the air is extremely cold in winter; but in ſummer it is very pleaſant, cool, and refreſhing in the former, but exceſſively hot in the latter. Sometimes it is winter on the north ſide of a mountain when it is ſummer on the other; nay, flowers may be gathered ſometimes with one hand and ſnow with the other. Prodigious maſſes of ice and ſnow often fall from them in winter, and do a great deal of damage; and moſt of the ſtreams and rivers take their riſe from the thawing of the ice and ſnow on their ſides and tops. From the riſing or deſcending of the clouds, with which they are commonly enveloped, the inhabitants can, for the moſt part, pretty exactly foretel the changes of the weather; ſo that they ſerve them inſtead of weather glaſſes.

The other and lower parts of Switzerland are very pleaſant and fertile, being diverſified with vineyards, cornfields, meadows, and paſture-grounds. The mountains in theſe are but mole-hills in compariſon of the others; there is neither ſnow nor ice on them in ſummer; and they frequently afford not only good paſturage, but arable ground. Many petrifactions are found both among ſands

Switzerland.

these and the others, with a variety of fossils. The sands of the rivers yield gold dust, particularly those of the Rhine, the Emmet, and the Aar, the Reuss, the Arve, and the Inn.

The metals of this country being generally found to be brittle, the only mines that are worked are a few of iron. In the lower parts of Switzerland they sow rye, oats, barley, spelt, flax, hemp. Wines of various sorts are also produced in some of them, with a variety of fruits. Of wood for fuel and other uses there is generally plenty; in some places, however, they are obliged to burn sheep's dung, and in others a kind of heath and small shrubs. In the valleys they cultivate saffron with success. The Swiss derive their principal subsistence from their flocks and herds of cattle, which in summer graze on the mountains. Their cheese is much esteemed, especially that of Berne and Griers in the canton of Friburg. Great numbers of horses are also bred here, and bought up for the French cavalry.

5 Lakes.

Besides the above-mentioned rivers, the Rhone and the Tesin have their sources in this country. The lakes are very numerous; but the chief are those of Geneva, Neufchatel, Biel, Zurich, Thun, Brien, Constance, and Lucerne. Both rivers and lakes abound with fish, and afford a cheap water-carriage. Switzerland is not so populous as many other countries in Europe; and the Popish cantons less so than the Protestant. The total number of the inhabitants is computed at 2,000,000.

6 Language, religion, &c.

The language generally spoken here is the German, in which also public affairs are transacted; but in those parts of the country that border on Italy or France, a corrupt French or Italian prevails. The two predominant religions are Calvinism and Popery. Of the former are the cantons of Zurich and Berne, the towns of St Gal, Geneva, Muhlhausen, and Biel, the principality of Neufchatel, the greater part of Basle, Schaffhausen, the country of the Grisons, the Thurgau, Toggenburg, Glaris, and the Rhine valley; the frontiers of Appenzel, with a small part of Solothurn, and some places in the mountains of Baden and Sargans. The rest of the Swiss cantons, allies, and dependents, are Popish. For the education of youth there is an university at Basle, and academies at Zurich, Berne, Lausanne, and Geneva; besides gymnasiums and scholæ illustres, both in the Popish and Protestant cantons. There are also societies among them for the improvement of the German language, and the sciences.

7 Manufactures and trade.

The principal manufactures are snuff and tobacco, linen of several sorts, lace, thread, silk, and worsted stockings, neckcloths, cotton stuffs, gloves, handkerchiefs, silks of several sorts, gold and silver brocades, a variety of woollen manufactures, hats, paper, leather of all sorts, earthen wares, porcelain, toys, watches, clocks, and other hardwares, &c. The trade of Switzerland is generally promoted by many navigable lakes and rivers. In some of the above manufactures, and in cheese, butter, sheep, horses, black cattle, hides, and skins, the exports are considerable; and as the imports are chiefly grain and salt, with some American and Asiatic goods, there is probably a large balance in their favour. In some parts of Switzerland dress is restrained by sumptuary laws.

8 Character of the Swiss.

The Swiss are a brave, honest, hospitable, hardy people; very true to their engagements, friendly and humane. In short, there is not a people in Europe whose national character is better. In their persons they are generally tall, robust, and well-made; but their complexions are none of the best, and those that live in the neighbourhood of the mountains are subject to wens. The women are said to be generally handsome and well-shaped, sensible, and modest, yet frank, easy, and agreeable in conversation. Few of the peasants are miserably poor; many of them are rich, especially in the Protestant cantons, and that of Berne in particular.

9 Outline of the history of Switzerland.

In the very confined limits to which we are now reduced, we cannot give more than a faint outline of the history of Switzerland. In the first century before the Christian era, we find the natives involved in frequent wars with the Romans, by whom the Helvetii and the Rhætii, two of the most powerful tribes, were entirely subjugated. In the beginning of the 4th century of the Christian era, the Allemanni, a German tribe, made an irruption into Switzerland, occupied the country, and, as is supposed, extirpated the Helvetii. Soon after we find the western part of Switzerland, as far as the Reuss, occupied by the Franks, by whom it was annexed to Burgundy, while the eastern part, or the Grisons, was subject to Theodoric the Goth, and other Italian princes. In the beginning of the 7th century, Christianity was introduced, chiefly by two Irish monks, Columbanus and Gallus. In the beginning of the 10th century, that part of Switzerland which was occupied by the Allemanni, was invaded by the Huns or Ugurs, who in particular ravaged the abbey of St Gal, at that time famous for its power and its literature. The Huns were defeated by Conrad king of Burgundy, about the year 928. Soon after the commencement of the 11th century, the districts of Switzerland began to be regarded as a part of the German empire, and in the two following centuries they gradually became subject to the house of Hapsburgh. In 1307 commenced the struggles of the Swiss with the house of Austria, those glorious struggles which finally terminated in the complete emancipation of that brave people, and in the formation of a confederacy which continued to be the admiration of Europe for nearly five centuries. The transactions which mark this contest between the inhabitants of a small district and a mighty monarch, and in particular the heroism of their great champion William Tell, are familiar to most of our readers. We shall therefore only give a short account of the government and institutions of the Swiss cantons, as they existed previous to the late revolution, and shall conclude this article with a brief narrative of the proceedings of the French, when they entered Switzerland in 1797.

10 Constitution of the Swiss cantons before the late revolution.

With respect to the government and constitution of the Swiss cantons, it must be remarked that some of them were aristocracies and some democracies. In the former, both the legislative and executive power were lodged in the burghers or citizens of the capital of each canton; and of those there were seven, viz. Zurich, Berne, Basle, Friburg, Soleure, and Schaffhausen; an account of the most important of which may be seen under their respective names. In the others, the legislative power was lodged in the whole body of the people, and every male above 16, whether master or servant, had a vote in making laws and in the choice of magistrates. For what concerned the whole Helvetic body, there were diets ordinary and extraordinary; the former were

held

Switzerland.

held annually, and the others on particular emergencies; and both were summoned by the city of Zurich, which appointed the time and place of their meetings. Besides the general diets since the Reformation, there were particular diets of the two religions, at which all public affairs of consequence that regarded the two parties were treated separately; for though a sense of their common interest obliged them to study the maintaining the league and union, yet it is certain that the mutual confidence between the cantons was in some measure lost through the zeal of each party for their particular opinions, especially of the Roman Catholics. The annual general diets were held always at Frauenfield or Baden, principally to regulate the affairs of the common baillages. Lucerne took the lead of the Roman Catholic cantons, being the most powerful of that denomination; but Zurich, though less powerful than that of Berne, took the precedence of all the other cantons, both Protestant and Popish. These cantons did not make one commonwealth, but were so many independent states, united together by strict alliances for their mutual defence. The extraordinary diets or congresses were held at Aldorf. Each canton usually deputed two envoys, both to the ordinary and extraordinary, to which also the abbot and the town of St Gal, and the town of Biel, sent representatives. To the 13 cantons belonged in common 21 baillages, 2 towns, and 2 lordships. The allies, as they were called, were the abbot and town of St Gall, the three Grison leagues, the republic of the Valais, the towns of Muhlhausen and Biel, the principality of Neuenburg, Geneva, and the bishop of Basle. Of these, the abbot and town of St Gal, and the town of Biel, were regarded as members of the Helvetic body, but the rest only as allies.

The public revenues were in general very inconsiderable, though they have been computed at about 1,000,000l. sterling, arising chiefly from the usual regalia, appropriated every where to the sovereign, the demesnes, and public granaries, voluntary contributions, the sale of salt, and a land-tax; in the Protestant cantons, from the church lands also that were seized at the reformation. Except in Zurich, Berne, Basle, and Schaffhausen, where the people are more industrious, have a greater trade, and are richer than in the others, they defrayed only the ordinary charges.

The cantons never kept any standing troops except for a few garrisons; but their militia was reckoned to be the best regulated of any in Europe. Every male from 16 to 60 was enrolled, and about one-third of them formed into regiments. They were all obliged to provide themselves with arms, clothing, accoutrements, and to appear on the stated days for exercise; and the several cantons and districts were obliged to furnish themselves with a sufficient train of artillery, and all the other implements of war. The Swiss of the several cantons were allowed to engage in the service of such foreign princes and states as were in alliance with those cantons, or with whom they had made a previous agreement. Such states paying an annual subsidy to the respective cantons, were allowed to make levies. Every man enlisted voluntarily, for what number of years he pleased, at the expiration of which he was at liberty to return home. Many thus always returning from foreign service, Switzerland was never unprovided with able and experienced officers and soldiers.

Switzerland.

11 Origin of the disputes between the cantons and the French republic.

It was scarcely to be expected that a country so long and so intimately connected with France, by its position, by perpetual alliance, by commerce, and partly by language, should escape the influence of the principles of its revolution, when states far more remote and distinct were strongly imbued with their spirit. But previous to the epoch of the French revolution, various parts of the Swiss confederation had been the seat of civil discord, and popular murmurs. In some cantons the indignant spirit of the subject had led him to revolt against what he deemed the oppressive administration of the ruler; in others, the distinctions which exist in society, and which form the different classes of privileged and unprivileged individuals, were strangely and inversely distributed. The French revolution, declaring the principle of equality, found a wide predisposition among the subjects of the Swiss confederacy to embrace the cause, and as strong a resistance on the part of the governors, who were deeply interested in opposing the progress of opinions so immediately subversive of authority. Conscious that with such a system no brotherhood could be cherished, many of the leading cantons kept themselves in a state of watchfulness, bordering on hostility, against the principles established by the French national assembly. But with so powerful a sanction, the frowns of power were ineffectual to calm the murmurs of discontent; and claims, which fear or policy had hitherto shut up in silence, were now produced, with confidence that they would be admitted from the sentiment of fear, if not of justice.

Among those who were most active in demanding a review of their grievances were the inhabitants of the French part of the canton of Berne, known by the name of the Pays-de-Vaud. The nobles and the higher classes of this province had long transmitted to their children a hereditary hatred of the government of Berne. This disaffection was not concealed; nor is it singular that the desire of change should operate on the titled and the rich, while they saw their political existence depending on the will of a self-elected sovereign, and their provinces subjected to the administration of an emissary of those whom they considered as usurpers of their rights.

But however strongly the sensibility of the subject inhabitants of the Pays-de-Vaud was excited by this political degradation, they were compelled to submit, or brood over their grievances in silence. They were incapable of procuring redress by force; and the sovereign burghers of Berne were too firmly seated to regard the remonstrances of impotent claimants, or to listen to the murmurs of discontent. Partial insurrections against the governments of certain cantons had often taken place in Switzerland. These disorders had sometimes been suppressed and punished with the interposition of the neighbouring cantons, where the danger was not excessive; but when these insurrections wore the serious characters of rebellion or revolt, the whole confederation marched against the conspirators. France before the revolution had even lent its aid to the suppression of those domestic quarrels, and had become the instrument of vengeance to the insulted sovereign; so that, whatever was the degree of oppression, or whatever the desire of resistance, redress was become hopeless, and change impossible.

It was chiefly among the classes of burghers and artizans who inhabited the towns, that discontent against the

Switzerland.

the ruling power prevailed. The peasants, less oppressed, because more ignorant of their rights and privileges, not only did not themselves oppose the aggressions of the chief men in power, but even assisted them in quelling insurrections which arose among their rival classes.

All writers agree in the existence of vexatious and oppressive abuses among all the governments of the Swiss cantons, at the time of which we are now writing. The despotism of their institutions; the abuses of election to sovereign councils; the daily and encroaching spirit of authority; the overgrown influence of patrician families; the striking inequality which prevailed, even on this basis, of aristocratical power; the monopoly of places of profit to the exclusion of worth and talent; the undefined limits of proconsular administration; the want of encouragement to the arts and sciences; the neglect of education among those who were destined to rule, the void of which was filled up by idleness, arrogance, ignorance, and dissipation,—are so many features presented by writers of different characters and discordant sentiments, to fill up the picture of this vaunted region of happiness and liberty.

The severity exercised by the government of Berne over those inhabitants of the Pays-de-Vaud who had assembled on the 14th of July 1791, to commemorate the taking of the Bastile at Paris, and express their approbation of the French revolution, had created in the minds of the French people sensations of jealousy towards their Swiss neighbours; while the disbanding and dismissal of the Swiss regiments in the service of France, had contributed to exasperate the government of the cantons against the new republic.

All the cantons, except that of Berne, appeared for a long time disposed to preserve a neutrality towards revolutionary France; but that canton, under pretence of supporting the people of Geneva against the aggressions of the French, first displayed an avowed hostility, and marched a body of 15,000 troops towards the frontiers of the French republic. The true cause of this movement in the canton of Berne, has been by others stated to be the hopes entertained by some individuals of that government, of sharing in the plans of emolument and preferment which were expected to arise on the re-establishment of monarchy in France. The mutual jealousy subsisting between the Swiss cantons and the ruling power in France, was heightened by the protection given by some of the cantons to the French emigrants, and by the correspondence which others of the cantons had held with the bloody tribunal of Robespierre. After the retreat of the allied armies from the frontiers of France, the Swiss found it politic to make at least a show of amity towards the victorious republic; and accordingly recognised the existing government of the republic, and openly received M. Barthelemy as its *charge d'affaires*. Still, however, the sincerity of the cantons was justly doubted by the French directory, who appear to have long formed designs against the independence of Switzerland.

12 The Pays de Vaud occupied by the French, anno 1798.

The directory, confirmed in power, and relieved from the controul of a popular legislature, hastened, towards the close of the year 1797, to put in force their project of subjugating the Swiss republics. The first hostile movement on the part of the French, was to take possession of the Helvetic part of the bishopric of Basle, under some frivolous pretence, and contrary to an express treaty concluded with the Swiss in the year 1792. Either too weak or too prudent to resent this infraction of their rights, the Helvetic body still flattered themselves with an amicable termination of their difference with France; when an insurrection, which broke out in the *Pays-de-Vaud*, probably through French instigation, or at least through the influence of French principles, afforded a fuller pretext for the overthrow of the government. In the month of December, the French directory thought proper to interfere in this domestic dispute, and demanded from the government of Berne, what they termed the restoration of the rights of that people, and the assembling of the states of the Pays-de-Vaud in their ancient form. This demand they immediately prepared to enforce by arms; and General Menard was ordered to march, with a body of 15,000 men, to support the claims of the petitioning party in the Pays-de-Vaud. The designs of the French were for the moment frustrated by the timidity or generosity of the supreme council of Berne. On the 5th of January, 1798, they issued a proclamation, enjoining the citizens of the Pays-de-Vaud to assemble in arms, to renew the oath of allegiance, to proceed immediately to the reform of every abuse in the government, and to assert and re-establish all their ancient rights. A commission had been previously appointed at Lausanne, for determining on the claims of the petitioners, and for reinstating the country in its former tranquillity. From what causes it happened, we have not as yet been correctly informed, but the proceedings of the commission seemed involved altogether in embarrassment and delay. The people became impatient, and the insurrection at once broke out into actual hostility. The castle of Chillon was seized by the insurgents; and the commotions which took place in the southern districts of the province appeared no less formidable. The government of Berne now determined to reduce the insurgents by force; and a body of 20,000 troops, under the command of Colonel Weiss, was dispatched to disperse them. Whether the lenient measures pursued by this general, were consistent with sound policy or not, it is impossible, from the materials which have hitherto fallen under our inspection, to determine. Suffice it to say, that though it is not certain that more precipitate movements would have saved the country, yet his inactivity undoubtedly served to increase at once the power and the audacity of the insurgents. Thus situated, the approach of the French decided the contest. On passing the boundary, Menard dispatched an aide-de-camp, attended by two hussars, to General Weiss, at Yverdun; on their return, a fatal affray took place at the village of Thierens, in which one of the hussars was killed. Who were the aggressors in this unfortunate business is not correctly ascertained, but it was regarded by Menard as a declaration of war. His troops immediately advanced, while those of Weiss retreated, and the whole of the Pays-de-Vaud was, by the beginning of February, in the possession of the French.

The government of Berne still hoped, it appears, to avert the destruction which now seemed to await them; the centinels who had killed the hussar at Thierens were delivered up, and fresh negotiations were entered on. In the mean time, however, new insurrections were planned in different parts, and the revolutionary mania appeared to increase. In the seditious assemblages

Switzerland.

on these occasions, the French envoy, Mengaud, was observed to take a decided part; and, on the 2d of January, he formally reclaimed some persons who had been arrested for treasonable practices by the government of Berne, as the friends and allies of the French republic. To this reclamation the government of Berne paid little attention; and the standard of revolt having been erected at Arau, they determined on effective measures for its suppression and their own defence. The Argovian militia marched to Arau; the town and province were immediately reduced, and the leaders of the insurrection were taken into custody.

13 Preparations for war on the part of the cantons.

War now appeared inevitable. To conciliate the minds of the people, and induce them more freely to lend their assistance, the government of Berne decreed, that 52 deputies from the principal towns and communes should be added to the supreme council; and, on the 2d of February, these new deputies took their seats. A general reform of all the abuses of the government was the first resolution agreed on in their deliberations; and the example of Berne was followed by the cantons of Lucerne, Fribourg, Soleure, Schaffhausen, and Zurich.

While, in this state of things, fresh negotiations were commenced with the French directory, a defensive force of about 20,000 men was collected. The other Swiss cantons dispatched their quotas to the defence of Berne, which amounted to about 5,500 men. A truce had been concluded with the French general in the Pays-de-Vaud, where an officer of the name of Brune had succeeded Menard in the command. The truce was to have expired on the 1st of March; but General d'Erlach, fearful lest the spirit of his troops should slacken, demanded, on the 26th of February, positive orders to put his army in motion, and the council immediately made a decree to that effect. The plan of the campaign was now arranged by M. d'Erlach, and notice had been given to the posts that hostilities were to commence on the evening of the 1st of March; when the movements of the Swiss general were frustrated by the repeal of the decree which had been so hastily passed, and the negotiation was renewed with the French commander.

M. Mallet du Pan asserts, that the French general Brune, had agreed to prolong the truce for 30 hours; ut, on the 2d March, the castle of Dornach, at the northern extremity of the canton of Soleure, was attacked and carried by the French; and at the same time, 13,000 men were marched under the walls of Soleure, which capitulated to General Schawenbourg on the first summons. Fribourg was immediately after reduced by General Brune, and the Swiss army was forced to retreat.

While disaffection prevailed in the army of General d'Erlach, the inhabitants of Berne saw the rapid approach of the victorious army. On the 3d of March, the levy of the *Landsthurm*, or the rising of the people in a mass, was proclaimed. The expedient did not succeed in favour of the magistrates; the people were no sooner assembled in arms, than they of themselves dissolved the government; a provisional regency was elected for the occasion; the event was notified to General Brune; and to facilitate a pacification, an order was issued to dismiss the army, on condition that the French would keep the posts they at present occupied.

Unsatisfied with this concession, the French general insisted on the town receiving a French garrison. In the mean time all was confusion, both in Berne and in the army; the left division of which had mutinied, deserted their posts, and put to death some of their officers. By desertion, the Swiss army was now reduced to 14,000, to which might be added the undisciplined rabble which the Landsthurm had called forth. About 8000 of the regular forces were stationed at Neweneg, and 6400 held the position of Frauenbrun, against which General Schawenbourg advanced from Soleure, at the head of 18,000 men. On the morning of the 5th March, both posts were attacked by the French, and a momentary success seemed to crown the valorous efforts of the division at Neweneg; but those stationed at Frauenbrun were, after a vigorous resistance, obliged to retreat; M. d'Erlach rallied his men at Uteren, where a second engagement took place, but with no better success on the part of the Swiss. At Grouholtz, however, they again made a stand, whence they were driven to the gates of the capital, where they were completely routed. The Swiss, in this engagement, lost 2000 in killed and wounded; while the loss of the French was about 1800.

14 Berne entered by the French.

On the evening of the 5th, General Brune entered the city of Berne by capitulation. The divisions of the Swiss army stationed at Neweneg and Guminen retreated; the soldiers of this last column, in despair, put their officers to death; and the unfortunate d'Erlach, in flying from the field of battle, was murdered by his countrymen and soldiers.

The submission of nearly the whole of Switzerland followed the defeat of the Bernese. The democratic republics, however, still made a glorious stand, defeated General Schawenbourg, and forced him to retire with the loss of 3000 men.

15 Helvetic republic formed.

The Swiss confederacy, after this revolution, changed its constitution, and even its name. Provisional governments, under the direction of the French generals, were established in the different districts, and the whole assumed the name of the Helvetic republic. Contributions were levied as usual, by the French commissioners; and some shocking enormities are reported to have been committed, chiefly by the army of the Rhine; for the divisions which belonged to the army of Italy are said to have conducted themselves with superior humanity and justice *.

* See *New Annual Register* for 1798 and 1799.

16 Constitution of 1802.

In the beginning of 1802, a new constitution was framed for the Helvetic republic, under the direction of Bonaparte. Its leading features are as follows.

The Helvetic republic is one. Every citizen has a right of settling in any canton of the republic, and of exercising all the civil and political rights in the same manner as the citizens of the canton.

Berne is the capital of Helvetia. The Helvetic territory is divided into 21 cantons. The ecclesiastical property, in general, can be employed only for establishments of religious instruction, or of charity.

There is a central administration of the republic for the exercise of the national sovereignty, and an administration of the cantons. The administration of the cantons is composed of a diet and a senate. The diet is formed by the union of representatives from all the cantons, in the following proportions.—Berne, six; Zurich, two; Lucerne, five; Uri, one; Schweitz, three; Underwalden,

Underwalden, one; Zug, one; Glaris, one; Soleure, two; Fribourg, three; Baſle, two; Schaffhauſen, one; Appenzel, one; St Gal, four; Turgovia, two; Argovia, two; Baden, two; Vaud, four; Griſons, one; Teſſin, three; Valais, two. The members of the diet remain five years in office. The diet is to aſſemble regularly every year on the 1ſt of March. It ſhall be extraordinarily convoked by the ſenate when the majority of the cantons require it, or when itſelf ſhall judge that meaſure neceſſary. The preſident of the diet ſhall be the landamtman who is not in office. He has a caſting vote, in caſe the votes ſhall be equally divided. A deputation of four members from the ſenate ſhall aſſiſt at the diet, and ſhall take part in its deliberations, but without having a right to vote.

The ſenate is compoſed of two landamtmans, two ſtadtholders or lieutenants, and 26 counſellors. Each canton muſt have at leaſt one member in it. The ſenate forms the projects of laws and regulations, and ſubmits them to the ſanction of the cantons. The two landamtmans and their lieutenants have the direction of foreign affairs. The ſenate names and recalls diplomatic agents, on a propoſition from the landamtmans. The landamtman in office is to receive a ſalary of 16,000 livres, Swiſs currency; the ſecond landamtman, his two lieutenants, and the members of the petty council, 6000 livres; thoſe of the ſenate 4000. The ſenate may adjourn for three months. During this interval, the petty council exerciſes the executive power.

SWIVELS, a kind of ring made to turn round in a ſtaple, or other ring. Theſe are uſed when a ſhip lies at her moorings; alſo in tedders for cattle, that they may turn round without unwarping the tedder.

SWIVEL-Cannon, is a ſmall piece of artillery belonging to a ſhip of war, which carries a ſhot of half a pound, and is fixed in a ſocket on the top of the ſhip's ſide, ſtern, or bow, and alſo in her tops. The trunnions of this piece are contained in a ſort of iron crotch, of which the lower end terminates in a cylindrical pivot reſting in the ſocket, ſo as to ſupport the weight of the cannon. The ſocket is bored in a ſtrong piece of oak, reinforced with iron hoops, in order to enable it to ſuſtain the recoil. By means of this frame, which is called the *ſwivel*, and an iron handle on its caſcable, the gun may be directed by the hand to any object. It is therefore very neceſſary in the tops, particularly when loaded with muſket-balls, to fire down on the upper decks of the adverſary in action.

SWOONING. See MEDICINE, N° 274.

SWORD, an offenſive weapon worn at the ſide, and ſerving either to cut or ſtab. Its parts are, the handle, guard, and blade; to which may be added the bow, ſcabbard, pummel, &c.

SWORD of State, which is borne before the king, lords, and governors of counties, cities, or boroughs, &c. For or before the king, it ought to be carried upright; the hilt as low as the bearer's waiſt, the blade up between his eyes. For or before a duke, the blade muſt decline from the head, and be carried between the neck and the right ſhoulder. For or before an earl, the blade is to be carried between the point of the ſhoulder and the elbow: and for or before a baron, the blade is to be borne in the bend of the arm. This ceremonial form no leſs denotes the dignity of a governor than the coronet ſet on his coat of arms.

SWORD-Fiſh. See XIPHIAS, ICHTHYOLOGY *Index*.

SWORN BROTHERS (*fratres jurati*), perſons who, by mutual oath, covenanted to ſhare each others fortune. Formerly, in any notable expedition to invade and conquer an enemy's country, it was the cuſtom for the more eminent ſoldiers to engage themſelves by reciprocal oaths to ſhare the rewards of their ſervice. This practice gave occaſion to the proverb of *ſworn brothers* or *brethren in iniquity*, becauſe of their dividing plunder and ſpoil.

SYCAMORE-TREE. See ACER, BOTANY *Index*.

SYCOPHANT, an appellation given by the ancient Athenians to thoſe who informed of the exportation of figs contrary to law; and hence it is ſtill uſed in general for all informers, paraſites, flatterers, cheats, &c.

SYDENHAM, DR THOMAS, an excellent Engliſh phyſician, was the ſon of William Sydenham of Winford Eagle in Dorſetſhire, and was born there about the year 1624. He ſtudied at Magdalen-hall, Oxford; but left that univerſity when Oxford was garriſoned for King Charles I. and went to London: where, becoming acquainted with Dr Thomas Cox, an eminent phyſician, that gentleman perſuaded him to apply himſelf to the ſtudy of phyſic; accordingly, after the garriſon was delivered up to the parliament, he retired again to Magdalen-hall, entered on the ſtudy of medicine, and in 1648 was created bachelor of phyſic. Soon after, he was made a fellow of All-Souls college, and continued there ſeveral years: when, leaving the univerſity, he ſettled at Weſtminſter, became doctor of his faculty at Cambridge; grew famous for his practice; and was the chief phyſician in London from the year 1660 to 1670; at which period he began to be diſabled by the gout. He died in 1689. His works are highly eſteemed both at home and abroad. He was famous for his cool regimen in the ſmall-pox; for giving the bark after the paroxyſm in agues; and for his uſe of laudanum. He regulated his practice more by his own obſervations and inquiries, than by the method either of his predeceſſors or contemporaries.

SYENE, an ancient city of Egypt, ſituated, according to Mr Bruce, in north latitude 24° 0′ 45″. Pliny and Strabo both ſay that it lay directly under the tropic of Cancer. Whether Mr Bruce's authority be ſufficient to overturn the evidence of Pliny and Strabo, we ſhall leave to others to determine.

Syene is remarkable for being the place where the firſt attempt was made to meaſure the circumference of the earth. This was done by Eratoſthenes, whom Ptolemy Euergetes had invited from Athens to Alexandria. In this attempt two poſitions were aſſumed, viz. that Alexandria and Syene were exactly 5000 ſtadia diſtant from each other, and that they were preciſely under the ſame meridian; but both theſe are denied by Mr Bruce, who has made many obſervations on the ſubject, which our limits will not allow us to take notice of at preſent. He tells us, that there is at Aſum an obeliſk erected by Ptolemy Euergetes, the patron of Eratoſthenes, without hieroglyphics, directly facing the ſouth, with its top firſt cut into a narrow neck, then ſpread out like a fan into a ſemicircular form, with

with pavements curiouſly levelled to receive the ſhade, and make the ſeparation of the true ſhadow from the penumbra as diſtinct as poſſible. This is ſuppoſed by Mr Bruce to have been conſtructed with a deſign to vary the experiment of Eratoſthenes with a larger radius; and the inquiry concerning the dimenſions of the earth, in our author's opinion, was the occaſion of many obeliſks being erected in this kingdom; a demonſtration of which is, that the figure of the top is varied; being ſometimes very ſharp, and ſometimes a portion of a circle, in order to get rid of the great impediment ariſing from the penumbra, which makes it difficult to determine the length of the ſhadow with preciſion. It is now called *Aſſouan*.

SYLLA, Lucius Cornelius, was deſcended from the illuſtrious family of the Scipios. His behaviour in his younger years by no means correſponded with the excellent education which he had received. But debauchery, inſtead of bringing along with it infamy and ruin, its uſual attendants, ſerved only to increaſe the wealth of this fortunate Roman; for Nicopolis, a rich courtezan, whoſe affections he had gained, left him heir to her great eſtate.—He learned the art of war under Marius, whom he attended to Numidia in quality of queſtor. Though hitherto unaccuſtomed to arms, he became in a ſhort time the moſt ſkilful ſoldier in the army, while by his polite and obliging behaviour he gained the love and eſteem of every body. His courage and dexterity contributed a great deal towards the ſucceſs of the war; it was his eloquence in particular that perſuaded Bocchus to deliver up Jugurtha. He ſerved afterwards in the Social war, where his actions entirely eclipſed thoſe of every other commander. As a reward for this conduct he was raiſed to the prætorſhip. It is pretended by ſome that Sylla purchaſed this dignity; and that when he threatened one day to make uſe of the powers of *his* office againſt Strabo the father of Pompey, that Roman replied with a ſmile, "You are in the right to ſay ſo; your office is certainly *yours*, ſince you purchaſed it." Be this as it may, after the concluſion of the Social war he was made conſul, and ſoon after declared general of the army which was to be ſent againſt Mithridates king of Pontus. Marius, at that time the moſt renowned of the Roman generals, expected that the management of this war would have been committed to him, and was therefore much exaſperated at the diſappointment. The people were perſuaded by his intrigues to reverſe the former decree, and ſubſtitute him in place of Sylla. Upon this he ſent down officers to take the command of the army; but Sylla by this time had gained over the ſoldiers; who, inſtead of obeying the decree of the people, ſlew Marius's officers, and intreated Sylla to lead them inſtantly to Rome. Accordingly he entered the city ſword in hand, ſlew Sulpicius the conſul, obliged Marius to flee, new-modelled the laws, and afterwards marched into the Eaſt, and immediately laid ſiege to Athens; for that city, together with the reſt of Greece, had fallen into the power of Mithridates. He wrote to the Amphyctyons, who were aſſembled at Delphi, to ſend him all the gold which was depoſited in the temple of Apollo, becauſe he ſtood in need of money; promiſing, at the ſame time, to reſtore it again at the end of the war. When he received this treaſure, he obſerved, with an air of raillery, that he now no longer deſpaired of victory, ſince the gods themſelves furniſhed him with money to pay his troops. Famine ſoon obliged the Athenians to think of a ſurrender. Their ambaſſadors waited on Sylla, and began to harangue about Theſeus and Codrus, and Marathon and Salamis,—when he interrupted them, and exclaimed, "Go, repeat theſe fine orations in your ſchools; I have come hither, not to learn your hiſtory, but to chaſtiſe rebels." Athens was at laſt taken by aſſault, and Sylla was upon the point of deſtroying it, when he recollected its ancient glory, and ſpared (as he ſaid) the living for the ſake of the dead. After burning the Piræus, he gained two deciſive victories over the generals of Mithridates. In the ſecond battle, which was fought at Orchomenus, he was almoſt defeated; his troops began to flee, when, leaping from his horſe, he ſnatched up a ſtandard, and advanced againſt the enemy, crying out, "I will die here glorioufly; and, ſoldiers, when you are aſked where you abandoned your general, anſwer, At Orchomenus." This reproach recalled the courage of the Romans; they followed him to the charge, and gained a complete victory. Mithridates, humbled by theſe diſaſters, ſent ambaſſadors to ſue for peace.

Mean time Cinna had declared againſt Sylla in Italy; and Marius returning from baniſhment, had taken the moſt ſevere vengeance on all his enemies. Sylla was declared a traitor; his laws were reverſed, his friends murdered, and the government new-modelled. The news of theſe tranſactions induced Sylla to conclude a treaty with Mithridates, and march directly to Rome. His approach terrified the Romans. Marius and Cinna were both dead; but the conſuls made vigorous preparations to oppoſe him. A civil war was begun; but Sylla in the end ſubdued all his enemies, and entirely ruined the Marian faction. He entered Rome at the head of his victorious army, and publicly aſſumed the ſurname of *Happy*. Happy, indeed, had he ceaſed to live when he ceaſed to conquer. The remainder of his life contains nothing elſe but a catalogue of the moſt abominable cruelties. He declared that every one who expected a pardon for their late offences, muſt gain it by deſtroying the enemies of the ſtate. The ſword of the aſſaſſin was thus unſheathed, and murder encouraged as the path to power and diſtinction. The nobleſt of the Romans were everywhere maſſacred; ſlaves were rewarded for cutting off their maſters; children were ſeen dragging their parents to execution; and brothers claiming a recompenſe for the murder of brothers. Sylla ordered 8000 wretches, who had thrown themſelves upon his clemency, to be butchered in the Campus Martius. In the mean time he entered the ſenate-houſe, and began to talk with great coolneſs about his exploits. The ſenate, alarmed at the horrid outcries of the ſufferers, at firſt thought that the city was given up to be plundered; but Sylla informed them, with an unembarraſſed air, that it was only ſome criminals puniſhing by his orders, and that they needed not be apprehenſive about their own fate.

To carry on theſe cruelties with the appearance of juſtice, he commanded the people to elect him dictator. He kept this office for more than two years; and then, to the amazement of all, laid it down, and offered to ſtand his trial before the people. Soon afterwards he retired into the country, and plunged headlong into every kind of debauchery. Nor did he relinquiſh his cruelty

cruelty together with his power: His wife falling ill in the midſt of a ſumptuous feaſt, he divorced her immediately; and ordered her to be carried away, leſt her death ſhould interrupt the feſtivity of his houſe.

He died of the morbus pedicularis, in the 60th year of his age. His body, according to his orders, was burnt. A little before his death he wrote his epitaph; the tenor of which was, that no man had ever exceeded him in doing good to his friends or injury to his enemies.

His perſon was elegant, his air noble, his manners eaſy and apparently ſincere. He was fond of pleaſure, but fonder of glory; indulging without ſcruple in ſenſual delights, but never ſuffering them to interrupt his ſerious buſineſs: He was eloquent, liberal, crafty, inſinuating; a profound maſter of diſſimulation; he ſpoke of himſelf with modeſty, while he laviſhed praiſes on every other perſon: He ſtooped even to an acquaintance with the meaneſt ſoldier, and conſtantly adapted himſelf to the humours, purſuits, and opinions, of thoſe with whom he converſed. Such was his character during the earlier part of his life; but when ſucceſs had raiſed him above the neceſſity of diſſimulation, he diſplayed a hideous train of vices, which his ambition had formerly taught him to conceal.—It was Sylla who recovered the works of Ariſtotle at the taking of Athens.

SYLLABLE, in *Grammar*, one or more letters pronounced by a ſingle impulſe of the voice, forming a complete ſound, and conſtituting a word or a part of a word. No ſingle letter can form a ſyllable except a vowel. The longeſt ſyllable in the Engliſh language is the word *ſtrength*.

The moſt natural way of dividing words into ſyllables is, to ſeparate all the ſimple ſounds of which any word conſiſts, ſo as not to divide thoſe letters which are joined cloſe together according to the moſt accurate pronunciation.

SYLLABUB, a kind of compound drink, moſt uſed in the ſummer ſeaſon; ordinarily made of white wine, ſugar, and nutmeg, into which is milked a quantity of new milk from the cow. Sometimes it is made of canary in place of white wine; in which caſe the ſugar is ſpared, and a little lemon and nutmeg are added inſtead of it. To prepare it the beſt way, the wine and other ingredients, except the milk, are to be mixed over night, and the milk or cream added in the morning. The proportion is, a pint of wine to three of milk. For

SYLLABUB, *whipt*, to half a pint of white wine or Rheniſh is put a pint of cream, with the whites of three eggs. This they ſeaſon with ſugar, and beat with birchen rods, or work with a ſyringe. The froth is taken off as it riſes, and put into a pot; where, after ſtanding to ſettle two or three hours, it is fit to eat.

SYLLABUS, in matters of literature, denotes a table of contents, or an index of the chief heads of a book or diſcourſe.

SYLLOGISM, in *Logic*, an argument or term of reaſoning, conſiſting of three propoſitions; the two firſt of which are called *premiſes*; the laſt, the *concluſion*. See LOGIC, Part III.

SYLVIA, a genus of birds, belonging to the order of paſſeres, formed by Dr Latham by limiting the motacilla to the wagtail, and arranging the other ſpecies, formerly claſſed under that genus, under the ſylvia. He makes 13 ſpecies of the motacilla, and 174 ſpecies of the ſylvia. See MOTACILLA, ORNITHOLOGY *Index*.

SYMBOL, a ſign or repreſentation of ſomething moral, by the figures or properties of natural things. Hence ſymbols are of various kinds; as hieroglyphics, types, enigmas, parables, fables, &c.

SYMMACHUS, a citizen and ſenator of ancient Rome, and conſul in the year 391, has left us ten books of epiſtles; from which, as well as from other things, we collect, that he was a warm oppoſer of the Chriſtian religion. He was baniſhed from Rome by Valentinian or ſome account or other, but afterwards recalled and received into favour by Theodoſius. Ammianus Marcellinus ſpeaks of him as a man of great learning and modeſty. Scioppius, Pareus, and other learned men, have written notes upon the epiſtles of Symmachus: we know of no later edition of them than that of Frankfort, 1642, 8vo. Ambroſe biſhop of Milan wrote againſt Symmachus, and ſo did the Chriſtian poet Prudentius.

SYMMETRY, the juſt proportion of the ſeveral parts of any thing, ſo at to compoſe a beautiful whole.

SYMMETRY, in *Painting*. See PAINTING, Part I. Sect. III.

SYMONDSBOROUGH, a remarkable large barrow of Flints, near Wellington in Devonſhire, in the northern extremity of Hemyock. The common people have a notion that a king called *Symon* was buried here. The tradition of the country plainly ſhows that it was the burial-place of ſome perſon or perſons of eminence.

SYMPATHETIC, ſomething that acts or is acted upon by ſympathy. Thus we ſay, ſympathetic diſeaſes, inks, &c.

SYMPATHETIC Inks. See *Sympathetic* INK.

SYMPATHY, an agreement of affections and inclinations, or a conformity of natural qualities, humours, temperaments, which make two perſons delighted and pleaſed with each other.

SYMPATHY, alſo denotes the quality of being affected by the affection of another; and may ſubſiſt either between different perſons or bodies, or between different parts of the ſame body. It is either ſimilar or diſſimilar; ſimilar, when the affection or action in the ſympathiſer is ſimilar to the affection or action in the ſympathant; and diſſimilar, when thoſe are different.—Sympathy too, is often an imitative faculty, ſometimes involuntary, frequently without conſciouſneſs: thus we yawn when we ſee others yawn, and are made to laugh by the laughing of another.

Sympathy, according to Dr Jackſon *, relates to the operations of the affections of the mind, to the operations of the imagination, and to the affections of the external ſenſes.

* *Treatiſe on Sympathy.*

1. The paſſions and affections of the mind produce in the body different ſenſations and impreſſions, and, as ſympathies of conſciouſneſs, determine in general the ſpirits to thoſe parts which labour moſt, or are moſt apt to be affected. Thus fear and anger determine to the heart; luſt to the eyes, &c.; joy, pity, wonder, and the like, to the head. See PASSION, page 14.

The affections of the mind of one perſon will often work upon the ſpirits of many. Thus whole companies are ſometimes diſpoſed to be ſad and melancholy, or merry and jovial, when any one is preſent much inclined to either of thoſe ſtates of mind; and it has been obſerved,

Sympathy. obſerved, that old people, who have loved the company of the young, and have been converſant continually with them, have generally lived long. But young people muſt not conclude from this, that the company and converſation of the grave and old will operate upon the living and ſenſitive principle, through the affections of their mind, and diſpoſe them to be ſhort-lived. On the contrary, by thus improving their underſtanding, they will be more enabled to fortify their conſtitution and reſiſt the ravages of youthful indulgence.

It may alſo be further obſerved, that thoſe tender ſympathetic affections which lay hold of the mind, at the repreſentation of theatrical performances, originate from the ſame principle, while they are to be conſidered as the ſureſt teſt of juſt execution in the actor, and of the expreſſive language of the author. Indeed all ſtage effect depends on ſympathy.

It has been ſaid, that the paſſions of the mind are occaſionally infectious, particularly ſome of them. Thus *fear* and *ſhame* are ſometimes very ſuddenly ſo. We frequently may have occaſion to ſee, that the ſtarting of one will make another ready to ſtart. Again, when one man is out of countenance in company, others will often bluſh in his behalf. However, the ſerious paſſions may ſurely be ſo under the controul of reaſon as to reſiſt infection, whatever may be the caſe of temporary, muſcular, or nervous attraction.

2. Our author is inclined to think, that a connection between the affections and ſenſations of the female mind and uterus, is very materially concerned in the proceſs of generation, and probably can alone give efficacy to thoſe actions and impreſſions ſubſervient to conception, through the ſympathizing affections of the mind. But this is a ſubject of which we know ſo little, that the ſpeculations of even the moſt diſtinguiſhed philoſophers reſpecting it have been nothing but the wild ravings of imagination.

With reſpect to the depravity and force of the imagination in the production of ſympathies, they always operate moſt upon "weak minds and ſpirits, and therefore moſt on women, ſuperſtitious and fearful perſons, ſick people, children, and young creatures." Their effects, however, ſometimes fail to appear, becauſe they are encountered and overcome by the mind and ſpirit before they work any manifeſt effects."

Such effects are obviated upon the ſame principle which eſtabliſhes the prevention of bodily diſeaſe: "for in infection and contagion from body to body (as, for example, during the plague), the miaſma may be received; but from the ſtrength and good diſpoſition of the body, it is expelled and wrought out before it has had ſufficient time to form the diſeaſe."

It has been ſaid, and many are of the opinion, that the force of imagination doth often forward the end propoſed. Thus, for inſtance, it has been put as a queſtion, "Whether a man, when he conſtantly and ſtrongly believes that ſuch a thing ſhall be (as that ſuch a one will love him, and the like), helps any thing to the effecting the thing deſired?" Certainly not in the manner which has been advanced, namely, "by a ſecret operation on the ſpirit of another." If he ſucceeds, it is either becauſe he perſevered, or becauſe his perſeverance and earneſtneſs (and not any occult operation) makes him at length be attended to.

There is not a doubt but the force of imagination often gives energy to our actions. It may, however, unleſs we are much on our guard, eaſily delude us aſide from reaſon. It has been the tree which has yielded the fruits of ſuperſtition in former times, and which has often fed the human mind with the moſt extravagant notions of ſympathy. Sympathies of this kind, ſuch as the power of charms, and the like, are now pretty generally exploded.

3. The five ſenſes, *hearing*, *taſting*, *ſmelling*, *feeling*, and *ſeeing*, are conſcious of a ſympathetic impreſſion from odious objects. "1. A diſagreeable ſound will ſet the teeth on edge, and make all the body ſhiver. 2. The ſwallowing of a nauſeous medicine will be attended with a ſhaking of the head and neck. 3. Diſagreeable ſmells produce nearly the ſame effect, which are leſs perceived, becauſe there is a remedy at hand by ſtopping the noſe. 4. If you come ſuddenly out of the ſun into the ſhade, the ſenſe of feeling is diſturbed by a chillneſs or ſhivering of the whole body. 5. And even ſudden darkneſs produces a propenſity to ſhivering.

There is a very apparent reaſon why a ſympathy ſhould take place between the eyes. Hence their motions are ſynchronous. It may be ſaid, that cuſtom and habit diſpoſe the eyes to move one and the ſame way; "for when one moveth towards the noſe, the other eye moveth from the noſe."

Though the eyes are by nature prone to move in concert, cuſtom will, however, deſtroy this natural concert, and produce the contrary effect. Thus ſome people can ſquint when they will. Our author therefore gives this caution to mothers and nurſes: "Let them not ſuffer infants to ſit with a candle placed behind them; for both their eyes will be diſpoſed to move outwards, as affecting to ſee the light of the candle, which may bring on the habit of ſquinting."

It appears as a quality in the ſenſes of hearing and ſeeing, "that the inſtrument of each ſeparate ſenſe has a ſympathy and ſimilitude to that which giveth the reflection." Thus it has been obſerved, "that the eye will ſympathize with a cryſtal glaſs or water, and the ear with caves and ſuch hollow places as are ſuited to report echo."

Sympathies have been compared to uniſons of ſound in muſic. Uniſons of ſound produce agreeable ſympathetic feelings; the reverſe produce diſagreeable feelings. "All concords and diſcords of muſic are (no doubt) ſympathies and antipathies of ſound." Moreover, "they are ſaid to work as well by report of ſound as by motion."

The moſt agreeable as well as odious objects operate in a ſecondary way, in producing thoſe ſympathetic impreſſions and actions which they commonly give riſe to. An increaſed ſecretion of ſaliva often takes place at the ſight of a favourite diſh; and the running of water from a bottle, or otherwiſe, will ſometimes affect individuals of a particular temperature, with an involuntary propenſity to void urine.

Many have attempted to account for the remarkable ſympathy which takes place between parts of the body ſeemingly unconnected with each other; but as theſe attempts are merely conjectures, without any ſolid principles to reſt on, we paſs them over as the dreams of ingenious men. It would be fortunate for ſcience, if men would confine themſelves to thoſe ſubjects which can be known,

known, and never draw conclusions till they have established principles. See PHYSIOLOGY, chap. ii.

SYMPHONIA, a genus of plants belonging to the class of monadelphia. See BOTANY *Index*.

SYMPHONY, in *Music*, properly denotes a consonance or concert of several sounds agreeable to the ear, whether vocal or instrumental, called also *harmony*. See HARMONY.

SYMPHYSIS, in *Anatomy*, one of the kinds of junctures or articulations of the bones. See ANATOMY, n° 2.

Cutting the SYMPHYSIS of the Pubes. See MIDWIFERY, N° 136.

SYMPHYTUM, COMFREY, a genus of plants belonging to the class pentandria; and in the natural system ranging under the 41st order asperifoliæ. See BOTANY *Index*.

SYMPLOCE, συμπλοκη, in *Rhetoric*, a figure, where the same word is repeated several times in the beginning and end of a sentence, including the ANAPHORA and EPITROPHE: thus, *Quis legem tulit? Rullus. Quis majorem populi partem suffragiis privavit? Rullus. Quis comitiis præfuit? Idem Rullus.*

SYMPLOCOS, a genus of plants belonging to the class polydelphia. See BOTANY *Index*.

SYMPOSIARCH, in antiquity, the director or manager of an entertainment. This office was sometimes performed by the person at whose charge the entertainment was provided; sometimes by another named by him; and at other times, especially in entertainments provided at the common expence, he was elected by lot, or by the suffrages of the guests.

SYMPTOM, in *Medicine*, any circumstance which indicates the existence, nature, or stage of a disease. Pain, waking, drowsiness, convulsions, suppression of urine, difficulty of breathing and swallowing, coughs, distastes, nauseas, thirsts, swoonings, faintings, looseness, costiveness, dryness and blackness of the tongue, are the principal *symptoms* of diseases. See MEDICINE, n° 41. and 58.

SYMPTOMATICAL, in *Medicine*, is a term often used to denote the difference between the primary and secondary causes in diseases: thus a fever from pain is said to be symptomatical, becauses it rises from pain only.

SYNÆRESIS, CONTRACTION, in *Grammar*, a figure whereby two syllables are united in one; as *vemens* for *vehemens*.

SYNAGOGUE, among the Jews, is a place where that people met to worship God. Authors are not agreed about the time when the Jews first began to have synagogues:—Some suppose them as old as the ceremonial law, and others fix their beginning to the times after the Babylonish captivity. They erected synagogues not only in towns and cities, but also in the country, especially near rivers, that they might have water for their purifications and ceremonious washings. No synagogue was built in any town, unless there were ten persons of leisure in it; but there might be many in one town, or in one quarter of a town, provided it was very populous. Jerusalem is said to have contained 480. The chief things belonging to a synagogue were, 1. The ark or chest, made after the model of the ark of the covenant, containing the Pentateuch. 2. The pulpit and desk in the middle of the synagogue, in which he that was to read or expound the law stood. 3. The seats or pews for the people. 4. The lamps to give light at evening service, and the feast of dedication. 5. Rooms or apartments for the utensils and alms chests. The synagogue was governed by a council or assembly, over whom was a president, called *The Ruler of the Synagogue*. These are sometimes called *Chiefs of the Jews*, *The Rulers*, *The Priests* or *Elders*, *The Governors*, *The Overseers*, *The Fathers of the Synagogue*. Their business was to punish the disobedient, by censures, by excommunication, or by penalties, such as fines and scourging; to take care of the alms, which are frequently called by the name of righteousness. The chief ruler, or one of the rulers, gave leave to have the law read and expounded, and appointed who should do it. In every synagogue, there were several ministers who had different offices assigned to them. Service was performed three times a day. viz. in the morning, in the afternoon, and at night; at the time of morning sacrifice, evening sacrifice, and after the evening sacrifice on Mondays, Thursdays, and Saturdays, there was a more forcible obligation upon the people to attend than upon the other days. There are synagogues at London, Amsterdam, Rotterdam, Avignon, Metz, &c.

Wilson's Archæological Dictionary.

SYNALOEPHA, in *Grammar*, a contraction of syllables, performed principally, by suppressing some vowel or diphthong at the end of a word, on account of another vowel or diphthong at the beginning of the next. As, *ill' ego*, for *ille ego*, &c.

Conticuer' omnes intentiqu' ora tenebant. Virg.

It is called by the Latins *collisio*.

SYNARTHROSIS, SYNCHONDROSIS, } See ANATOMY, N° 2.

SYNCELLUS, or SINCELLUS, an ancient officer in the family of the patriarchs, and other prelates of the eastern church. The word, in the corrupt Greek, συγκελλος, signifies a person who lies in the chamber with another; a *chamber-fellow*, or *chum*. The syncellus was an ecclesiastic, who lived with the patriarch of Constantinople, to be a witness of his conduct; whence it is, that the syncellus was also called the *patriarch's eye*, because his business was to observe and watch. The other prelates had also their syncelli, who were clerks living in the house with them, and even lying in the same chamber, to be witnesses of the purity of their manners. Afterwards the office degenerated into a mere dignity; and there were made syncelli of churches.—At last it became a title of honour, and was bestowed by the emperor on the prelates themselves; whom they called *pontifical syncelli*, and *syncelli Augustales*.

SYNCHRONISM denotes the happening of several things at the same time. See CHRONOLOGY.

SYNCOPATION, in *Music*, denotes a striking or beating of time, whereby the distinction of the several times or parts of the measure is interrupted. However, it is more properly used for the connecting the last note of any measure, or bar, with the first of the following measure, so as only to make one note of both. A syncope is sometimes also made in the middle of a measure. Syncopation is also used when a note of one part ends or terminates on the middle of a note of the other part. This is otherwise denominated *binding*. It is likewise used for a driving note; that is, when some shorter note at the beginning of a measure, or half measure, is followed

Syncopation || Synodals.

lowed by two, three, or more longer notes before another ſhort note occurs, equal to that which occaſioned the driving, to make the number even, e. gr. when an odd crotchet comes before two or three minims, or an odd quaver before two, three, or more crotchets. In ſyncopated or driving notes, the hand or foot is taken up, or put down, while the note is ſounding.

SYNCOPE, FAINTING; a deep and ſudden ſwooning during which the vital functions are ſuſpended. See MEDICINE, N° 98. and 272.

SYNCOPE, in *Grammar*, an eliſion or retrenchment of a letter or ſyllable out of the middle of a word, as *caldus* for *calidus*.

SYNDIC, in government and commerce, an officer, in divers countries, intruſted with the affairs of a city or other community, who calls meetings, makes repreſentations and ſolicitations to the miniſtry, magiſtracy, &c. according to the exigency of the caſe.

SYNECDOCHE, in *Rhetoric*, a kind of trope frequent among orators and poets. See ORATORY, N° 56.

SYNECPHONESIS, in *Grammar*, a coalition, whereby two ſyllables are pronounced as one; being much the ſame as SYNALOEPHA and SYNÆRESIS.

SYNEUROSIS. See ANATOMY, N° 2.

SYNGENESIA, (συν and γενεσις, "congeneration)," the name of the 19th claſs in Linnæus's artificial ſyſtem. See *Claſſification*, BOTANY *Index*.

SYNGNATHUS, PIPE-FISH, a genus of fiſhes belonging to the cartilaginous order. See ICHTHYOLOGY, page 104.

SYNOCHA, and SYNOCHUS, in *Medicine*, the names of two ſpecies of continued fever. See MEDICINE, N° 164.

SYNOD, in *Aſtronomy*, a conjunction or concourſe of two or more ſtars or planets, in the ſame optical place of the heavens.

SYNOD ſignifies alſo a meeting or aſſembly of eccleſiaſtical perſons to conſult on matters of religion.

Of theſe there are four kinds, viz. 1. *General*, or *œcumenical*, where biſhops, &c. meet from all nations. Theſe were firſt called by the emperors, afterwards by Chriſtian princes; till in later ages the pope uſurped to himſelf the greateſt ſhare in this buſineſs, and by his legates preſided in them when called. 2. *National*, where thoſe of one nation only come together, to determine any point of doctrine or diſcipline. The firſt of this ſort which we read of in England, was that of Herudford or Hertford, in 673, and the laſt was that held by Cardinal Pole, in 1555. 3. *Provincial*, where thoſe only of one province meet, now called the *convocation*. 4. *Dioceſan*, where thoſe of but one dioceſe meet, to enforce canons made by general councils, or national and provincial *ſynods*, and to conſult and agree upon rules of diſcipline for themſelves. Theſe were not wholly laid aſide, till by the act of ſubmiſſion, 25 Hen. VIII. c. 19. it was made unlawful for any *ſynod* to meet, but by royal authority. See COUNCIL and CONVOCATION.

SYNODS, *Provincial, in the Government of the Church of Scotland*. See PRESBYTERIANS, N° 14.

SYNODALS, or SYNODIES, were pecuniary rents (commonly of two ſhillings), paid to the biſhop, or archdeacon, at the time of their eaſter viſitation, by every pariſh prieſt. They were thus called, becauſe uſually paid in ſynods: becauſe anciently biſhops uſed to viſit and hold their dioceſan ſynods once.—For the ſame reaſon, they are ſometimes alſo denominated *ſynodalica*; but more uſually, *procurations*.

Synodical || Syracuſe.

SYNODICAL, ſomething belonging to a ſynod. Thus, ſynodical epiſtles are circular letters written by the ſynods to the abſent prelates and churches; or even thoſe general ones directed to all the faithful, to inform them of what had paſſed in the ſynod.

SYNOECIA, in Grecian antiquity, a feaſt celebrated at Athens in memory of Theſeus's having united all the petty communities of Attica into one ſingle commonwealth; the feat whereof was at Athens, where all the aſſemblies were to be held. This feaſt was dedicated to Minerva; and, according to the ſcholiaſt on Thucydides, it was held in the month *Metagitnion*.

SYNONYMOUS, is applied to a word or term that has the ſame import or ſignification with another.

Several works have been compoſed for the expreſs purpoſe of explaining ſynonymous words. In 1777 a work was publiſhed on the Latin ſynonyma at Paris by M. Gardin Dumeſnil. The abbé Girard publiſhed one on the ſynonymous terms of the French language many years ago. Another was publiſhed on the ſame ſubject in the year 1785 by the abbé Roubaud. An account of the Engliſh ſynonyma was publiſhed by an anonymous author in 1766; which is a cloſe imitation, and in ſome parts a literal tranſlation, of the abbé Girard's *Synonymes François*. Mrs Piozzi has written ſome eſſays on the ſame ſubject.

SYNOVIA, in *Medicine*, a term uſed by Paracelſus and his ſchool for the nutritious juice proper and peculiar to each part. Thus they talk of the ſynovia of the joints, of the brain, &c.

SYNTAX, in *Grammar*, the proper conſtruction or due diſpoſition of the words of a language into ſentences and phraſes. See GRAMMAR and LANGUAGE.

SYNTHESIS, in *Logic*, denotes a branch of method, oppoſite to analyſis.

In the ſyntheſis or ſynthetic method, we purſue the truth by reaſons drawn from principles before eſtabliſhed or aſſumed, and propoſitions formerly proved: thus proceeding by a regular chain, till we come to the concluſion. Such is the method in Euclid's Elements, and moſt demonſtrations of the ancient mathematicians, which proceed from definitions and axioms, to prove propoſitions, &c. and from thoſe propoſitions proved to prove others. This method we alſo call *compoſition*, in oppoſition to *analyſis* or *reſolution*. See ANALYSIS.

SYPHILIS. See MEDICINE, N° 350.

SYPHON. See HYDRODYNAMICS. Some uncommon phenomena in nature may be accounted for upon the principles of the ſyphon; as, for inſtance, that of reciprocating ſprings. See PNEUMATICS, N° 373.

SYRACUSE, a celebrated city of Sicily, and once the capital of the iſland. It was built, according to Thucydides and Strabo, by Archias, one of the Heraclidæ, who came from Corinth into Sicily in the ſecond year of the 11th Olympiad, and derived its name from a neighbouring marſh named *Syraco*. What form of government firſt prevailed in the city is not known. Many have ſuppoſed it originally to have been governed by kings: but if this were the caſe, the monarchical government continued only for a very ſhort time; ſince Ariſtotle, Diodorus Siculus, and Juſtin, mention it as being very early ſubject to a democracy. The hiſtory

At what time built.

is

Syracuse.

is obscure and unimportant till the time of Gelon, when Syracuse first began to make a conspicuous figure.

2 Gelon seizes on the sovereignty.

Gelon was born in the city of Gela in Sicily, of the family of Telines, who had been created priest of the infernal gods. He signalized himself in a war carried on against the Syracusans, by Hippocrates tyrant of Gela, whom he defeated in a pitched battle. Having thus become very powerful among his countrymen, he soon found means to seize on the sovereignty for himself. In a short time, having put himself at the head of some Syracusan exiles, he marched towards that place, where he was received with loud acclamations and obtained possession of the city.

Gelon, in order to people the capital of his new dominions, first demolished the neighbouring city of Camarina, and transplanted the inhabitants to Syracuse. Soon after, entering into a war with the Megareans, he defeated them, took and rased their cities, and in like manner transplanted the people. Syracuse thus became powerful, and full of inhabitants; and the friendship of Gelon was courted both by Athens and Lacedæmon at the time of the Persian invasion. In the mean time the Carthaginians had entered into a treaty with the Persians; by which it was agreed, that the former should attack those of the Greek name in Sicily and Italy, in order to divert them from assisting each other.

3 Defeats the Carthaginians, and takes the title of king.

Sicily was accordingly invaded by the Carthaginians with a vast army; but they were utterly overthrown by Gelon, as is related under the article CARTHAGE, N° 7—9. After this victory, the people out of gratitude obliged him to assume the title of king; which till that time he had refused. A decree also passed by which the crown was settled on his two brothers Hiero and Thrasybulus after his death.

4 His excellent reign.

The new king, instead of keeping his subjects in greater awe, studied to make them happy, and was the first man who became more virtuous by being raised to a throne. He was particularly famous for his honesty, truth, and sincerity; is said never to have wronged the meanest of his subjects, and never to have promised a thing which he did not perform.

5 Gelon dies, and is succeeded by Hiero. An. 471. B. C.

Gelon died in the year 471 B. C. after having reigned three or four years; and was succeeded by his brother Hiero, whose character is differently drawn by different historians. He is highly celebrated in the odes of Pindar; and it is certain that his court was the resort of men of wit and learning, to whom he behaved in the most courteous manner and with the greatest liberality.

6 Thrasybulus, a tyrant. An 459. B. C.

In 459 B. C. Hiero was succeeded by Thrasybulus; who proving a tyrant, was in ten months driven out, and a popular government restored; which continued for the space of 55 years.

7 The Siculi subdued.

About this time the Syracusans entered into a war with the Siculi, which terminated in the total subjection of the latter; after which Syracuse became so powerful, that it in a manner gave law to the whole island. The Greek cities indeed enjoyed a perfect liberty; but they all acknowledged Syracuse as their metropolis: by degrees, however, the latter began to assume such an authority over them as was totally inconsistent with liberty; and this occasioned many wars, which involved them in much distress and danger. They began with the Leontines, whose territory they laid waste, and reduced their city to great straits. Leontini was an Athenian colony: and this furnished the Athenians, who had already meditated the conquest of Sicily, with a pretence to attack the Syracusans with their whole force. Under colour of assisting their countrymen therefore, they sent a fleet of 250 sail to Sicily; but the Leontines, sensible that their pretended allies aimed at nothing less than the conquest of the whole island, concluded a peace with Syracuse; and the disappointed Athenians vented their rage on those who had advised and conducted the expedition.

8 Syracuse invaded by the Athenians without success.

During the continuance of the popular government, the Syracusans took part in the long war between Athens and Sparta. The circumstances which took place in this contest are sufficiently detailed under ATTICA, N° 126—150.

9 New invasion by the Carthaginians.

This war was scarcely ended, when a new and formidable invasion by the Carthaginians took place; but the event of that expedition was as unfortunate to the Carthaginians as the former had been, as has been particularly related under the article CARTHAGE, N° 12. *et seq.*

10 Rise of Dionysius.

In the mean time, a considerable revolution had happened in Syracuse. The city of Agrigentum had been taken by the Carthaginians, and of the few inhabitants who escaped, some fled to Syracuse, where they accused the Syracusan commanders of having betrayed the city into the hands of the enemy. Dionysius, a man of great valour and address, but who had become very obnoxious to the populace, took this opportunity of attempting to retrieve his credit. He therefore supported the accusations brought against his countrymen by the Agrigentines, and even impeached the magistrates as having a secret intelligence with the enemy, and attempting to introduce an oligarchy. As his speech was entirely levelled against the more wealthy citizens, it was very agreeable to the lower class: the commanders were instantly degraded; and others, among whom was Dionysius, were appointed. Having once gained this point, he began to consider how he might get all his colleagues turned out. For this purpose he never joined in any council of war with the other commanders, nor imparted to them his resolutions, giving out that he could not trust them, and that they had more regard for their own interest than the welfare of their country. But while he was proceeding in this manner, the more prudent part of the citizens, perceiving what he aimed at, complained of him to the senate and magistrates, and fined him as a disturber of the public peace. According to the laws, the fine was to be paid before he could speak in public, and the circumstances of Dionysius did not allow him to discharge it. In this dilemma he was assisted by Philistus the historian, a man of great wealth, who not only paid this fine for him, but encouraged him to speak his mind freely, as it became a zealous citizen to do, promising to pay all the fines that should be laid upon him.

Being extricated out of this difficulty, Dionysius next proceeded to inveigh, with all the eloquence of which he was master, against those who by means of their power or interest were able to oppose his designs, and by degrees brought them into discredit. His next scheme was to get those exiles recalled whom the nobility had banished at different times; as thinking that they would support him with all their power, as well out of gratitude as out of hatred to the opposite party. Having gained this point also, he next found means to ingratiate him-

Syracuse.

ſelf with the ſoldiery to ſuch a degree, that, under pretence of taking proper meaſures for reſiſting the Carthaginians, he was choſen commander in chief, with abſolute and unlimited power. This was no ſooner done, than, pretending his life was in danger, he choſe out 1000 men for his guard, whom he attached to his intereſt by great promiſes. As no perſon durſt now oppoſe him, he poſſeſſed himſelf of the citadel, where all the arms and proviſions were kept; after which he publicly took the title of king of Syracuſe in the year 404 B. C.

11 who becomes king of Syracuſe. An. 404. B. C.

The Syracuſans did not tamely ſubmit to their new maſter: but Dionyſius managed matters ſo well, that their frequent revolts anſwered no other purpoſe than more certainly to entail ſlavery on themſelves; and he was allowed to poſſeſs the throne without much oppoſition till his death, which happened in the year 366 B. C.

12 Dionyſius II. An. 366. B. C.

On the death of Dionyſius, he was ſucceeded by his ſon, called alſo Dionyſius. He was naturally of a mild and peaceable temper, averſe to cruelty, and inclined to learning; but his father, to whom all merit, even in his own children, gave umbrage, ſtifled as far as poſſible his good qualities by a mean and obſcure education. He no ſooner aſcended the throne, than Dion, brother to Ariſtomache the other wife of Dionyſius the Elder, undertook to correct the faults of his education, and to inſpire him with thoughts ſuitable to the high ſtation in which he was placed. For this purpoſe he ſent for the philoſopher Plato, under whoſe care he immediately put the young king. This inſtantly produced a reformation on Dionyſius; but the courtiers, dreading the effects of the philoſopher's inſtructions, prevailed on him to baniſh Dion, and to keep Plato himſelf in a kind of impriſonment in the citadel. At laſt, however, he ſet him at liberty; upon which Plato returned to his own country.

13 Put under the care of Plato by his uncle Dion, whom he baniſhes.

Dion, in the mean time, viſited ſeveral of the Grecian cities, and at laſt took up his reſidence in Athens; but the honours which were everywhere paid him, raiſed ſuch jealouſies in the breaſt of the tyrant, that he ſtopped his revenue, and cauſed it to be paid into his own treaſury. In a ſhort time Dionyſius again ſent for Plato; but finding it impoſſible to diſſolve the friendſhip between him and Dion, diſgraced, and placed him in a very dangerous ſituation, in the midſt of aſſaſſins who hated him. Not daring, however, to offer him any violence, he allowed him ſoon after to depart; revenging himſelf on Dion, whoſe eſtate he ſold, and gave his wife Arete in marriage to Timocrates one of his own flatterers.

Dion now reſolved to revenge himſelf on the tyrant for the many injuries he had ſuſtained, and at once to deliver his country from the oppreſſion under which it groaned. He began with raiſing foreign troops privately, by proper agents, for the better execution of his deſign. Many Syracuſans of diſtinction entered into his ſcheme, and gave him intelligence of what paſſed in the city; but of the exiles, of whom there were upwards of 1000 diſperſed up and down Greece, only 25 joined him; ſo much were they awed by the dread of the tyrant. The troops were aſſembled at the iſland of Zacynthus, in number only about 800; but who had all been tried on many occaſions, were well diſciplined, and capable of animating by their example the forces which Dion hoped to find in Sicily. When they were about to ſail, Dion acquainted them with his deſign, the boldneſs of which at firſt occaſioned among them no ſmall conſternation; but Dion ſoon removed their fears, by telling them that he did not lead them as ſoldiers, but as officers, to put them at the head of the Syracuſans and all the people of Sicily, who were ready to receive them with open arms. Having then embarked in two ſmall trading veſſels, they arrived in 12 days at Cape Pachynum near Syracuſe. At laſt they arrived at the port of Minoa, not far from Agrigentum. Here they received intelligence that Dionyſius had ſet ſail for Italy, attended by a fleet of 80 galleys. On this Dion reſolved to take advantage of the tyrant's abſence, and immediately ſet ſail for Syracuſe. On his march he prevailed on the inhabitants of Agrigentum, Gela, Camarina, and other cities, to join him. As ſoon as he entered the territories of Syracuſe, multitudes flocked to him; and as nobody appeared to oppoſe him, he boldly entered the city, where he quickly found himſelf at the head of 50,000 men. As ſoon as he had landed in Sicily, Timocrates, to whom his wife Arete had been given by Dionyſius, and to whom the care of the city had been left, diſpatched a courier to let the tyrant know the danger in which he was. Dionyſius was, however, accidentally prevented from receiving a timely account of Dion's arrival; ſo that when he entered the citadel by ſea, ſeven days after Dion's arrival, he found his affairs in a deſperate ſituation. Upon this he had recourſe to artifice; and having amuſed the Syracuſans by a feigned negotiation, until he obſerved that they kept a negligent guard, he attacked them all at once with ſuch fury, that he had almoſt taken the city. But Dion encouraged the ſoldiers by his example ſo much, that he at laſt obtained a complete victory; for which they preſented him with a crown of gold.

14 Dion raiſes troops for dethroning the tyrant.

15 Enters Syracuſe without oppoſition.

16 Dionyſius arrives, but is totally defeated.

It was not long, however, before the ungrateful Syracuſans began to think of conferring quite different rewards on their benefactor. Dionyſius had the addreſs to render him ſuſpected by the multitude; at the ſame time that Heraclides, an excellent officer, but a ſecret enemy to Dion, did all that lay in his power to ſink his credit. Dionyſius was ſoon obliged to fly into Italy, but left Heraclides to oppoſe Dion.

17 Ingratitude of the Syracuſans to Dion.

At length Dion got poſſeſſion of the city, Heraclides ſubmitted to him, and was received into favour; but as his ſeditious and turbulent behaviour ſtill continued, Dion at laſt gave orders to put him to death. This action, however neceſſary, ſo affected the mind of Dion, that he became melancholy; and ever after imagined himſelf haunted by a frightful ſpectre, reſembling a woman of gigantic ſtature, with the haggard looks and air of a fury. In a ſhort time after he loſt his life, through the baſe treachery of Calippus, or Gylippus, who pretended to be his intimate friend, and who immediately after cauſed his wife and ſiſter to be carried to priſon.

18 Dion becomes melancholy, and is murdered.

Calippus having removed Dion, ſoon made himſelf maſter of Syracuſe, where he committed all manner of cruelties; but was driven out, and forced to fly to Rhegium, where he was murdered with the ſame dagger which had killed Dion. In 350 B. C. Dionyſius again made himſelf maſter of Syracuſe; and being exaſperated by his paſt misfortunes, tyrannized worſe than ever. The Syracuſans firſt had recourſe to Icetas tyrant of Leontini; but as the Carthaginians took this opportunity to invade

19 Dionyſius reſtored.

Syracuse.

vade them with a powerful fleet and army, they were obliged to apply to the Corinthians. By them Timoleon, a celebrated commander, was sent to the assistance of the Syracusans, whom he found in a very distressed situation; Icetas being master of the city, the Carthaginians of the harbour, and Dionysius of the citadel. As all parties were equally the enemies of Dionysius, he found it impossible to hold out, and therefore surrendered himself to Timoleon, by whom he was sent to Corinth; where at last he was reduced to the necessity of teaching a school for his support.

20 Surrenders to Timoleon, and keeps a school at Corinth.

After the expulsion of the tyrant, Timoleon withdrew to Catana, leaving only 400 Corinthians, under the command of an experienced officer named *Leon*, to guard the citadel. These were immediately besieged by Icetas and the Carthaginians, but Timoleon found means to relieve them in spite of all opposition; and having dispersed emissaries through the army of Mago the Carthaginian general, exhorting the mercenary Greeks to forsake him, he was so much intimidated, that in spite of all the remonstrances Icetas could make, he set sail for Africa, leaving his colleague to carry on the war in the best manner he could.

21 Cowardice of the Carthaginians.

The day after the departure of Mago, Timoleon assaulted the city so briskly, that the troops of Icetas were driven from the walls, and the Corinthians became masters of the place. Timoleon, by sound of trumpet, invited the inhabitants to come and assist in demolishing the citadel and other castles, which he called the *nests of tyrants;* after which he caused edifices to be erected in the place where the citadel had stood, for the administration of justice. He found the city in a most miserable situation: for many having perished in the wars and seditions, and others having fled to avoid the oppression of tyrants, Syracuse, once so wealthy and populous, was now become almost a desert; insomuch that the horses were fed on the grass which grew on the market-place. Timoleon supplied the city with inhabitants from Corinth and other cities of Greece, at the same time that great multitudes from Italy and the other parts of Sicily resorted thither. Timoleon distributed the lands among them *gratis;* but sold the houses, and with the money arising from the sale established a fund for the support of the poor. Having thus restored Syracuse, he in like manner delivered all the Greek cities of Sicily from the tyrants who had taken possession of them, all of whom he put to death. After this he resigned his authority, and led a retired life, honoured in the highest degree by the Syracusans, and by all the cities in Sicily. After his death he was honoured as a god; the expence of his funeral was defrayed by the public; sports, with horse-races and gymnastic exercises, were held annually on the day of his death; and it was decreed, that whenever the Syracusans were at war with the barbarians, they should send to Corinth for a general.

22 Citadel of Syracuse and other forts demolished by Timoleon.

23 He repeoples the city.

24 Dies, and is honoured as a god.

For 20 years the Syracusans enjoyed the fruits of Timoleon's victories; but new disturbances arising, in a short time another tyrant started up, who exceeded all that had gone before him in cruelty and other vices. This was the celebrated Agathocles, of whose exploits against the Carthaginians a full account is given under the article CARTHAGE, N° 33—53. He was poisoned by one Mœnon in the year 289 B. C. after having reigned 28 years, and lived 95.—A succession of tyrants followed, till at last the city, being held by two rivals, Tœnion and Sosistratus, who made war within the very walls, Pyrrhus king of Epirus was invited into Sicily, in order to put an end to these distractions. He willingly complied with the invitation; and was everywhere received with loud acclamations, as the deliverer not only of Syracuse, but of all Sicily. As he had a fine army of 30,000 foot and 5000 horse, with a fleet of 200 sail, he drove the Carthaginians from place to place, till he left them only the two strong posts of Eryx and Lilybæum. The former of these he took by assault, and was himself the first man who mounted the walls, after having killed a great number of Africans with his own hand. The Mamertines likewise, who had conquered a considerable part of the island, were everywhere defeated and driven out, till at last they were shut up in the city of Messana. The Carthaginians, alarmed at the rapidity of his conquests, sent ambassadors with proposals of peace upon very advantageous terms; but Pyrrhus, puffed up with the expectation of reducing the whole island, refused to hearken to any terms unless they would instantly abandon it. So firm was he in the belief of this, that he caused his son to assume the title of *king of Sicily;* but in the mean time, having displeased the Sicilians by his arbitrary behaviour, they deserted from him in such numbers that he was glad to set out for Italy, for which retreat the embassies he received from the Samnites, Tarentines, and other Italians, furnished him with an honourable pretext. He embarked in the ships which he had brought with him from Italy; but was met at sea by the Carthaginians, who sunk 70 of his vessels, and dispersed or took the rest; so that he saved himself in Italy only with 12 vessels, the poor remains of a fleet of 200 sail. No sooner were the Mamertines apprised of his departure, than they dispatched a body of 18,000 men to harass him after his landing. These, having passed the straits before him, posted themselves in the road which Pyrrhus must take in marching by land to Tarentum; and concealing themselves among woods and rocks, attacked him unexpectedly, and with great resolution. But Pyrrhus behaved on this occasion with his usual bravery. The attack being made on his rear, he hastened thither, and made a dreadful slaughter of the enemy, till a wound on his head obliged him to retire.

25 Syracuse again falls under the power of tyrants.

Syracuse.

26 Pyrrhus king of Epirus invited into Sicily.

27 Syracuse harassed by the Mamertines.

After the departure of Pyrrhus, Hiero the son of Hierocles, a descendant of Gelon, the first king of Syracuse, was chosen general of the forces, along with another named *Artemidorus*. The two generals had nothing more at heart than to put an end to the confusion and disorder which reigned in the city; for which reason they entered it at the head of their forces. On this occasion Hiero discovered extraordinary talents for government. By mere dint of insinuation and address, without shedding blood, or hurting a single citizen, he calmed the minds of the people; reconciled the factions; and so gained the affections of all, that he was invested with the whole civil as well as military power in the state. Soon after this, he married the daughter of one of the first citizens; and having distinguished himself by his exploits against the Mamertines, was unanimously elected king of Syracuse, in the year 265 B. C.

28 Hiero chosen general of the Syracusan forces.

29 Is elected king of Syracuse. An. 265. B. C.

Some time after Hiero's accession to the throne, he again defeated the Mamertines, and reduced them to such straits, that they were obliged to call in the Romans

Syracuse.

mans to their assistance. The consequences of this have been fully related under the articles ROME and CARTHAGE. Hiero, who had allied himself with the Carthaginians, being himself defeated by the Romans, and finding his allies unable to protect him against the power of that republic, concluded an alliance with them; and continued faithful to them even in the time of the second Punic war, when they were in the greatest distress. In his reign flourished the celebrated mathematician Archimedes, whose genius he employed in fortifying the city of Syracuse, by innumerable machines, in such a manner as rendered it absolutely impregnable to every method of attack known at that time.

30 Hieronymus allies with the Carthaginians.

Hiero died about 211 B. C. and was succeeded by his grandson Hieronymus: but he imprudently forsook the counsels of his grandfather, and entered into an alliance with the Carthaginians. Soon after this he was murdered, in consequence of his tyranny and cruelty, and the greatest disorders took place in the city; which Hannibal, though then in Italy, found means to foment, in hopes of keeping the Syracusans in his interest. This indeed he effected; but as his own affairs in Italy began to decline *, he could not prevent Marcellus from landing in Sicily with a formidable army, which the Sicilians could by no means resist. Syracuse was soon invested; but the machines invented by Archimedes baffled all attempts to take it by assault. The immense preparations which the consul had made for taking the city by storm, could not have failed to accomplish his purpose, had the place been otherwise defended than by the contrivance of Archimedes. The Roman fleet consisted of 60 quinqueremes, besides a far greater number of other ships. The decks were covered with soldiers armed with darts, slings, and bows, to drive the besieged from the ramparts, which on one side were washed by the sea, and to facilitate the approach to the walls. But a machine of Marcellus's own invention, called a *sambuca*, was what he chiefly depended on. The consul's design was to bring his sambuca to the foot of the walls of Acradina; but, while it was at a considerable distance (and it advanced very slow, being moved only by two ranks of rowers), Archimedes discharged from one of his engines a vast stone, weighing, according to Plutarch's account, 1250 pounds, then a second, and immediately after a third; all which, falling upon the sambuca with a dreadful noise, broke its supports, and gave the galleys upon which it stood such a violent shock that they parted, and the machine which Marcellus had raised upon them at a vast trouble and expence was battered to pieces. At the same time, several other machines, which were not visible without the walls, and consequently did not lessen the confidence of the Romans in the assault, played incessantly upon their ships, and overwhelmed them with showers of stones, rafters, and beams pointed with iron; insomuch that Marcellus, being at a loss what to do, retired with all possible haste, and sent orders to his land-forces to do the same; for the attack on the land-side was attended with no better success, the ranks being broken and thrown into the utmost confusion by the stones and darts, which flew with such noise, force, and rapidity, that they struck the Romans with terror, and dashed all to pieces before them.

* See *Carthage*, N° 123.

31 Syracuse invested.

32 Incredible effects of the machines of Archimedes.

Marcellus, surprised, though not discouraged, at this artificial storm, which he did not expect, held a council of war, in which it was resolved, the next day before sunrise, to come up close under the wall, and keep there. They were in hopes by this means to secure themselves against the terrible storm of stones and darts which fell on the ships when at a distance. But Archimedes had prepared engines which were adapted to all distances. When the Romans therefore had brought their ships close under the wall, and thought themselves well covered, they were unexpectedly overwhelmed with a new shower of darts and stones, which fell perpendicularly on their heads, and obliged them to retire with great precipitation. But they were no sooner got at some distance, than a new shower of darts overtook them, which made a dreadful havock of the men, while stones of an immense weight, discharged from other machines, either disabled or broke in pieces most of their galleys. This loss they sustained, without being able to revenge it in the least on the enemy. For Archimedes had placed most of his engines behind the walls, and not only out of the reach, but even out of the sight, of the enemy; so that the Romans were repulsed with a dreadful slaughter, without seeing the hand that occasioned it. What most harassed the Romans in the attack by sea, was a sort of crow with iron claws, fastened to a long chain, which was let down by a kind of lever. The weight of the iron made it fall with great violence, and drove it into the planks of the galleys. Then the besieged, by a great weight of lead at the other end of the lever, weighed it down, and consequently raised up the iron of the crow in proportion, and with it the prow of the galley to which it was fastened, sinking the poop at the same time into the water. After this the crow letting go its hold all of a sudden, the prow of the galley fell with such force into the sea, that the whole vessel was filled with water, and sunk. At other times, the machines, dragging ships to the shore by hooks, dashed them to pieces against the points of the rocks which projected under the walls. Other vessels were quite lifted up into the air, there whirled about with incredible rapidity, and then let fall into the sea, and sunk, with all that were in them. How these stupendous works were effected, few, if any, have hitherto been able to comprehend.

The troops under the command of Appius suffered no less in this second attack than the fleet. In the whole space of ground which the army, when formed, took up, the last files as well as the first were overwhelmed with showers of darts and flints, against which they could not possibly defend themselves. When they had with infinite trouble brought the mantelets and covered galleries, under which they were to work the rams, near the foot of the wall, Archimedes discharged such large beams and stones upon them as crushed them to pieces. If any brave Roman ventured to draw too near the wall, iron hooks were immediately let down from above, which, taking hold of his clothes or some part of his body, lifted him up in the air and dashed out his brains with the fall. Marcellus, though at a loss what to do, could not however forbear expressing himself with pleasantry: Shall we persist, said he to his workmen, in making war upon this Briareus, upon this giant with an hundred hands? But the soldiers were so terrified, that if they saw upon the walls only a small cord, or the least piece of wood, they immediately turned their backs and fled, crying out, that Archimedes was going to discharge some dreadful machine upon them.

Syracuse.

The consuls, finding themselves thus defeated in every attempt, turned the siege into a blockade, reduced most of the other places in the island, and defeated the forces which were sent against them; and at last Marcellus made himself master of Syracuse itself. He took the opportunity of a festival, when the soldiers and citizens had drunk plentifully, to make a detachment scale the walls of Tyche, in that part of it which was nearest to Epipolæ, and which was ill guarded. He presently after possessed himself of Epipolæ; whereupon the inhabitants of Neapolis, as well as Tyche, sent deputies to him, and submitted. Marcellus granted life and liberty to all of free condition, but gave up those quarters of the city to be plundered. The soldiers had orders to spare the lives of the citizens; but they were cruel in their avarice, slew many of them, and among the rest the incomparable Archimedes. He was very intent on a demonstration in geometry, and calmly drawing his lines, when a soldier entered the room, and clapped a sword to his throat. "Hold! (said Archimedes) one moment, and my demonstration will be finished." But the soldier, equally regardless of his prayer and his demonstration, killed him instantly. There are different accounts of the manner of his death; but all agree that Marcellus regretted it extremely, and showed a singular favour to his relations for his sake.

33 The siege turned into a blockade.

34 Account of the taking of Syracuse.

35 The city plundered, and Archimedes killed.

The city of Syracuse continued subject to the western empire till its declension, when the island of Sicily, being ravaged by different barbarians, the capital also underwent various revolutions; till at last, in the 9th century, it was so destroyed by the Saracens, that very few traces of its ancient grandeur are now to be seen. "The ancient city of Syracuse was of a triangular form, and consisted of five parts or towns. The circuit, according to Strabo, amounted to 180 stadia, or 22 English miles, and four furlongs. An account which Mr Swinburne once suspected of exaggeration; but, after spending two days in tracing the ruins, and making reasonable allowances for the encroachments of the sea, he was convinced of the exactness of Strabo's measurement.

36 Syracuse destroyed by the Saracens.

At present it is strongly fortified towards the land, and the ditches of the bastions form the communications between the two havens. It is very weak towards the sea, but the shelves render it hazardous to debark on that side. The garrison is one of the best appointed in the kingdom, but the heights of Acradina command the works.

About eighteen thousand inhabitants are now contained in it. The dwellings are far from being memorials of ancient Syracusan architecture or opulence. In any other situation they might be thought tolerable; but to observers who reflect on the style of those buildings that probably once covered the same ground, the present edifices must have a mean appearance. The ancient temple of Minerva is now turned into a cathedral. The walls of the cella are thrown down, and only as much left in pillars as is necessary to support the roof; the intercolumniations of the peristyle are walled up. This temple is built in the old Doric proportions used in the rest of Sicily; its exterior dimensions are 185 feet in length and 75 in breadth. There are also some remains of Diana's temple, but now scarcely discernible. Besides these, there are few ruins in the island; and one is surprised that any should exist in a place which had been so often laid waste by enemies, and so often shaken by earthquakes. E. Long. 25. 27. N. Lat. 37. 3.

Syria.

SYRIA, a very ancient kingdom of Asia, lying between the Mediterranean on the west, the Euphrates on the east, and Arabia Deserta, Phœnicia and Palestine, on the south.

1 Names, divisions, &c. of ancient Syria.

In ancient times this country was called *Aram*, probably from Aram the youngest son of Shem. At first it was parcelled out into several petty states; all of which seem afterwards to have been reduced under subjection to the four principal ones, Zobah, Damascus, Hamath, and Geshur. Afterwards the whole country was divided into two parts only, viz. Cœlesyria and Phœnicia; though the Phœnicians, Idumeans, Jews, Gazites, and Azotites, or the whole country of the Philistines, was included. After the death of Alexander, Syria, in the great extent of the word, was divided, according to Strabo, into Comagene, Seleucis of Syria, Cœlesyria, Phœnice on the sea coast, and Judea in the midland. Ptolemy, however, subdivides these; and in the Proper Syria reckons only Comagene, Pieria, Cyrrhistica or Cyrrhestica, Seleucis, Cassiotis or Casiotis, Chalybonitis, Chalcidice or Chalcidene, Apamene, Laodicene, Phœnicia Mediterranea, Cœlesyria and Palmyrene.

The history of the ancient Syrians, till the time of their being carried away by the kings of Assyria, is totally unknown, excepting a few particulars which may be gathered from Scripture, and which it is needless here to repeat. During the continuance of the Assyrian, Babylonian, and Persian monarchies, the history of this country affords nothing remarkable; but after the death of Alexander, it gave name to a very considerable empire, which makes a conspicuous figure in ancient history. At this time, however, it was not confined to Syria properly so called, but comprehended all those vast provinces of the Upper Asia which formed the Persian empire; being, in its full extent, bounded by the Mediterranean upon one side, and the river Indus on the other. The first king was Seleucus, one of the generals of Alexander the Great; who, after the death of that conqueror, being made governor of Babylon, was tempted, by the example of Alexander's other captains, to set up for himself. Eumenes, who had sincerely at heart the interest of Alexander's family, solicited his assistance against Antigonus, who had openly revolted; but Seleucus not only refused this assistance, but attempted to destroy Eumenes himself with his whole army. Eumenes, however, found means to escape the danger without the loss of a man. On this Seleucus endeavoured to gain over his troops: but finding that impossible, he made a truce with Eumenes, and granted him a safe passage through his province; but at the same time sent an express to Antigonus, desiring him to fall upon him, before he was joined by the governors of Upper Asia. Antigonus did not fail to follow his advice; but having prevailed against Eumenes through treachery, he next thought of bringing Seleucus himself under subjection. On his return to Babylon, therefore, after having been feasted with his whole army by Seleucus, he demanded of him an account of the revenues of his province. Receiving an unfavourable answer to this requisition, Antigonus was so much exasperated, that Seleucus, not thinking himself a match for him at that time, thought proper to fly into Egypt.

2 Seleucus the first king of Syria after Alexander the Great.

3 Obliged by Antigonus to fly into Egypt.

By

Syria.

By the flight of Seleucus, Antigonus was left master of all his provinces; but his son Demetrius being afterwards defeated by Ptolemy at Gaza, Seleucus began to think of recovering what he had lost. Having received from Ptolemy a very slender force, he set out towards Babylon, and procured reinforcements as he proceeded. As he approached the city, those who favoured Antigonus retired into the citadel, but were soon obliged to surrender; and in that fortress Seleucus found his children, friends, and domestics, whom Antigonus had kept prisoners ever since his flight into Egypt.

4 Becomes master of Babylon. An. 312. B. C.

Seleucus having made himself master of Babylon, in the year 312 B. C. began to prepare for encountering Antigonus, who he knew would soon attack him with all his force. Nicanor, governor of Media under Antigonus, first advanced against him at the head of 10,000 foot and 7000 horse; but Seleucus, with only 3000 foot and 400 horse, having drawn him into an ambush, cut off almost the whole of his army, and such of the soldiers as had escaped the slaughter willingly enlisted under his banner.

5 Defeats Nicanor, and reduces Media and Susiana.

The consequence of this victory was the submission of all Media and Susiana; but during his absence from the capital, Demetrius advanced towards it, and made himself master of it.

On the return of Seleucus to Babylon, he easily drove out the troops left by Demetrius, recovered the castle which he had garrisoned, and settled his authority on such a firm foundation, that it could never afterwards be moved. Having then marched again into Media, he defeated and killed with his own hand Nicanor or Nicator, whom Antigonus had sent against him; after which, having settled the affairs of Media, he reduced all Persia, Bactria, and Hyrcania, subjecting to his new empire these and all the other provinces on this side the Indus which had been conquered.

Seleucus being now master of all the countries which lie between the Euphrates and the Indus, took the title of king of Babylon and Media. But, not satisfied with these possessions, ample as they were, he crossed the Indus, in order to conquer those regions which had submitted to Alexander beyond that river. In this expedition, however, he was unsuccessful; but returning westward against his old enemy Antigonus, he defeated and killed him at Ipsus, and reduced his son Demetrius to a very dependent state. Seleucus now betook himself to the building of a city, which he called *Seleucia*, and which stood on the place where the city of Bagdad now stands. Besides these, he built a great many others; 16 of which he called *Antioch*, from the name of his brother Antiochus; nine *Seleucia*, from his own name; three *Apamea*, from Apama his first wife; one *Stratonicea*, from his second wife Stratonice; and six *Laodicea*, from his mother Laodice.

In 284 Seleucus entered into a war with Lysimachus, with whom he had hitherto lived in strict amity. Out of 36 general officers left by Alexander the Great, they two survived, and both were upwards of 70 years old. Nevertheless they were both filled with the ambition and animosity of young men. The two armies met at a place called *Curopedion* in Phrygia, where an obstinate engagement took place. Victory was long doubtful: but at last Lysimachus was run through with a spear, and died on the spot; on which his troops betook themselves to flight. This victory added to the possessions of Seleucus all those provinces which had formerly been subject to Lysimachus, and from this victory he is generally called *Nicator*, or *the conqueror*. His triumph, however, on this occasion, but was but short-lived; for, seven months after, as he was marching towards Macedon to take possession of that kingdom, he was treacherously murdered by Ptolemy Ceraunus, on whom he had conferred innumerable favours.

6 Defeats and kills Lysimachus.

7 Is himself treacherously murdered.

Seleucus was succeeded by his son Antiochus Soter, who held the empire 19 years. He resigned to Antigonus Gonatus all pretensions to the crown of Macedon; and having engaged in a war with Eumenes king of Pergamus, he was defeated by him, and obliged to yield up part of his dominions. He died in 261 B. C. and was succeeded by his son Antiochus Theos; who having engaged in a war with Ptolemy Philadelphus king of Egypt, the Parthians and Bactrians took that opportunity to revolt, and could never afterwards be reduced. In 246 B. C. he was poisoned by his wife Laodice, who raised to the throne her own son, named *Seleucus Callinicus*. He was succeeded by his eldest son Seleucus Ceraunus, a weak prince, who was poisoned by a conspiracy of two of his officers, when he had reigned one year; after which his brother Antiochus, surnamed the *Great*, ascended the throne in 225 B. C.

8 Antiochus Soter. An. 280. B. C.

9 Antiochus Theos. An. 261. B. C.

10 Seleucus Callinicus. An. 246. B. C.

11 Antiochus the Great. An. 225. B. C.

In the very beginning of his reign, two of his generals, Alexander and Molo, rebelled against him. The former had been appointed governor of Persia, and the latter of Media. Antiochus marched against the rebels, whom he defeated in a pitched battle; on which their chiefs laid violent hands on themselves. On his return he received the submission of the Atropatii, a barbarous people in Media; and put to death his prime minister Hermias, whom he had found hatching treacherous designs against him. During his lifetime, however, the traitor, by accusing Achæus of treason, had obliged him to revolt in his own defence; so that the king had still two important wars on his hands, viz. one with Ptolemy king of Egypt, and the other against Achæus. After some deliberation, he resolved to march first against the king of Egypt; and was at first very successful, reducing many cities in Cœlesyria and Palestine, and defeating the Egyptians in a pitched battle; but in the year 217 B. C. being worsted in the battle of Raphia, he was obliged to abandon all his conquests; of which Ptolemy immediately took possession, and Antiochus was obliged to cede them to him, that he might be at leisure to pursue the war against Achæus.

12 Suppresses one rebellion, but is embarrassed by another

Antiochus having made vast preparations for his expedition, soon reduced Achæus to such distress, that he was obliged to shut himself up in the city of Sardis, which he defended for some time with great bravery; till at last, being betrayed by two Cretans, he was delivered up to the king, and by his order put to death. Antiochus then undertook an expedition against the Parthians, whom he obliged to conclude a peace on very advantageous terms. He then turned his arms against the king of Bactria, whom he also compelled to agree to his terms. He then crossed Mount Caucasus, and entered India; where he renewed his alliance with the king of that country. From India he marched into Arachosia, Drangiana, and Carmania, establishing order and discipline in all those countries: then passing through Persia, Babylonia, and Mesopotamia, he returned to Antioch, after an absence of seven years.

13 His successes in the east.

Syria.

14 Enters into a league with Philip of Macedon against the king of Egypt. An. 204. B. C.

In the year 204 B. C. Antiochus entered into a league with Philip of Macedon, on purpose to deprive Ptolemy Epiphanes, the infant king of Egypt, of all his dominions. He defeated the Egyptian general, recovered all Palestine and Cœlesyria; after which he invaded Asia Minor, in hopes of reducing it also, and restoring the Syrian empire to the same extent it had in the time of Seleucus Nicator. The free cities in Asia Minor immediately had recourse to the Romans, who sent an embassy to Antiochus on the occasion; but as both parties put on those haughty and imperious airs to which they thought the greatness of their power gave them a right, no satisfaction was given, but every thing tended to an open rupture. While matters were in this situation, Hannibal the Great being obliged to leave his own country, fled to Antiochus: from whom he met with a gracious reception. As Hannibal had, while a child, sworn perpetual enmity against the Romans, he used all his eloquence to persuade Antiochus to make war with them; and as the many victories which he had gained over them left no room to doubt of his capacity, Antiochus doubted nothing of being able, by his assistance, to conquer that haughty people. Several embassies passed between the two nations; but chiefly with a design, on the part of Antiochus, to gain time. Hannibal endeavoured to draw his countrymen into the confederacy against Rome, but without effect. Antiochus having strengthened himself by several alliances, at last resolved to begin the war in earnest. The king imprudently became the aggressor, by falling on a body of 500 Romans before war had been declared. He also made King Philip his enemy, by entertaining the regent of Athamania, who was a pretender to the crown of Macedon. To complete all, he himself fell in love, though above 50 years of age, with a beautiful young woman of Chalcis, whom he married; and became so great a slave to this passion, that he entirely neglected his affairs; the army gave themselves up entirely to dissipation and debauchery, and every trace of military discipline vanished.

15 His conquests checked by the Romans.

16 Hannibal flees to him for protection.

17 Antiochus neglects the advice of Hannibal.

18 His shameful behaviour.

19 Is defeated by the Romans at Thermopylæ. An. 191. B. C.

In the year 191 B. C. Antiochus was raised from his lethargy by a declaration of war against him at Rome, and set out for Ætolia. His army at this time amounted to no more than 10,000 foot and 500 horse. He had been made to believe that he would receive a vast reinforcement in Ætolia: but when he came to make the experiment, he soon found his mistake; all the troops he could raise there amounted to no more than 4000 men, With this force, so exceedingly inadequate to the purpose, he was obliged to oppose the Roman army, who were advancing in conjunction with the Macedonians, and had already made surprising progress. Antiochus seized the straits of Thermopylæ; but was driven from them by the Romans, the king himself being the first that fled. Almost his whole army was destroyed in the battle or in the pursuit, and Antiochus returned with disgrace into Asia.

Soon after his return, Antiochus equipped a fleet of 200 sail; on which he immediately embarked for the Thracian Chersonesus, now Crim Tartary. He fortified the cities of Lysimachia, Sestus, and Abydos, with others in that neighbourhood, to prevent the Romans from crossing the Hellespont. In the mean time Polyxenidas the Syrian admiral sent intelligence to the king that the Roman fleet had appeared off Delos; upon which he desired him to seek them out and engage them at all events. He did so, and was defeated with the loss of 40 ships taken or sunk in the engagement. This was soon after revenged by the destruction of the Rhodian fleet by the artifice of Polyxenidas; but in the end the king's affairs went everywhere to wreck. Having laid siege to the city of Pergamus, he was obliged to raise it with loss; the Phœnician fleet commanded by Hannibal was defeated by the Rhodians; and soon after the Syrian fleet under Polyxenidas was utterly defeated by the Romans. Antiochus was so much disheartened by these repeated defeats, that he appeared like one infatuated. Instead of fortifying more strongly those cities which lay on the frontiers of his kingdom, he entirely deserted them: and thus Lysimachia and Abydos, the two keys to Asia, fell into the hands of the Romans without the least resistance.

20 His fleet defeated by that of the Romans.

21 Meets with two other defeats, and becomes like one infatuated.

The arrival of the Romans in Asia struck Antiochus with such terror, that he instantly sued for peace. The terms he offered were indeed very advantageous, but by no means agreeable to the expectations of the Romans. They therefore gave him this final answer: 1. That since he had drawn upon himself the war, he should defray the whole expence of it; 2. That he should restore liberty in general to all the Greek cities in Asia; and, 3. That to prevent future hostilities, he should relinquish all Asia on this side Mount Taurus. These terms, however, still appeared to him so intolerable, that he resolved to continue the war; and determined also to take the most imprudent method of carrying it on, namely, by hazarding all on the event of a general engagement. The king encamped near Magnesia, and strongly fortified his camp. The Romans insulted him in his trenches, and proposed to attack his fortifications if he continued to decline an engagement. At last the king, thinking it would be shameful for him longer to refuse an engagement, being at the head of an army far more numerous than that of the enemy, in a friend's country, and in the midst of his allies, resolved at all events to accept the challenge, and accordingly prepared for a decisive battle.

22 Sues for peace, but is refused.

23 Battle of Magnesia.

On the day of the battle the weather proved very favourable to the Romans; for a thick fog rising in the morning, the day was almost turned into night, so that the Syrian commanders could not have all the corps under their command in view, on account of their great extent, nor send them proper orders in time; whereas the fog was not thick enough to prevent the Roman generals from seeing their several bodies at the greatest distance, as they took up but little ground. Besides, the damp which was occasioned by the fog slackened the strings of the enemy's bows, so that the Asiatics who used them could shoot their darts and arrows but faintly. The whole dependence of Antiochus in the first attack was on his armed chariots, which were to cut their way into the Roman army. But Eumenes, king of Pergamus, undertook to render them useless, and even fatal, to the enemy. After this advantage, the Roman cavalry advanced, and fell on those whom the chariots had put in disorder. The Syrians being already intimidated, after a faint resistance gave way; and the Romans made a great slaughter of their men and horses, both being borne down with the weight of their heavy armour. Eumenes charged the left-wing, in which Seleucus commanded, with such vigour, that he put it to flight; and

24 The Syrians defeated.

Syria.

and the fugitives flying to the phalanx for protection, put that body likewise in disorder: which Domitius observing, advanced against it at the head of his legionaries, but could not break it till he ordered his men to attack the elephants, which the Syrians had placed in the spaces between the companies. The Romans had learned, in their wars with Pyrrhus and Hannibal, not to fear those monsters which were once so terrible to them. They attacked them, therefore, with great resolution; and driving them against the phalanx, put that body into disorder, by means of those very animals which had been posted there for its defence.

25 And their camp taken.

After a long and bloody contest, the Syrians were totally routed, and the Romans walking over heaps of dead bodies, marched up to the Syrian camp, attacked, and plundered it. The riches they found in it are not to be described; but the taking of it cost the Romans a new battle, which proved more fatal to the Syrians than that in the field; for the Romans having, in spite of a most desperate resistance, forced the intrenchments, gave no quarter, but put all to the sword without distinction. There fell this day in the battle, in the pursuit, and in the plunder of the camp, 50,000 foot and 4000 horse; 1500 were taken prisoners, and 15 elephants. In the consular army there were but 300 foot killed and 25 horse. Eumenes had only 15 of his men killed; so that this victory, as we are told by the ancients, seemed a prodigy to all nations both of the east and west.

Antiochus retired to Sardis with as many of his forces that had escaped the slaughter as he could draw together. From Sardis he soon marched to rejoin his son Seleucus, who had fled to Apamea. As for the consul, he took advantage of the king's defeat and flight, making himself master of all the neighbouring countries. Deputies hastened to him from all parts; the cities of Thyatira, Magnesia, Trallis, Magnesia in Caria, all Lydia, and Ephesus itself, though highly favoured by Antiochus, declared for the Romans. Polyxenidas, upon the news of the king's defeat, left the port of Ephesus, and sailed to Patara, where he landed with a very small guard, and returned by land into Syria. The consul took the road to Sardis, which opened its gates to him.

Antiochus finding his affairs in a bad situation both by sea and land, and not daring to appear before the consular army in the field, sent Antipater his brother's son, and Zeuxis, who had been governor of Lydia and Phrygia, to sue for a peace. They were ordered to treat chiefly with the elder Scipio, of whose clemency and good nature Antiochus entertained a high opinion. Accordingly, on their arrival at Sardis, where the consul then was with his brother, they addressed the latter, and were by him presented to the consul. Their speech was very submissive, and such as became a vanquished people.

26 Antiochus obtains peace on very hard terms.

Hereupon a council was summoned, and after long debates the ambassadors were called in; and Scipio Africanus proposed terms that were very humiliating.

The ambassadors of Antiochus had been ordered to refuse no terms; and therefore these were accepted, and the whole affair concluded. So that the Syrian ambassadors now prepared to set out for Rome, to get the conditions of peace proposed by Scipio ratified there. L. Aurelius Cotta was sent with the ambassadors to Rome, to acquaint the senate with the particulars of the treaty. When they appeared before the conscript fathers, they spoke with great submission, and only desired them to ratify the articles which the Scipios had offered to their master. The senate, after examining them, ordered that a treaty of peace should be concluded with Antiochus, and the articles of it engraved on brass, and fixed up in the Capitol. They only added one clause, which was, That the Syrians should change every year all their hostages, except the son of King Antiochus, who should continue at Rome as long as the republic thought fit. The peace being thus ratified, and all Asia on this side Mount Taurus delivered into the hands of the Romans, the Greek cities were by them restored to their liberty, the provinces of Caria and Lydia given to the Rhodians, and all the rest that had belonged to Antiochus bestowed upon Eumenes.

27 His death. An. 187. B. C.

Antiochus did not long survive his misfortune at Magnesia. He died in 187, and with him fell the glory of the Syrian empire. The Romans now gave laws to the kings of Syria, insomuch, that when Antiochus Epiphanes the grandson of Antiochus the Great hesitated at obeying the commands of the senate, one of the ambassadors drew a circle round him with a rod on the floor, and told him that he should not go out of that spot before he had told him what he was to do. The most remarkable transactions of this prince are his wars with the Jews, and persecutions of them; of which a full account is given under the article JEWS. After a variety of usurpers and tyrants, the kingdom of Syria fell under Tigranes king of Armenia in the year 83 B. C.; and upon his overthrow by the Romans, it became a province of the dominions of the republic. From them it was taken by the Saracens in the reign of the caliph Omar, and is now a province of Turkey in Asia. See ACRE.

28 Syria becomes a Roman province.

29 Climate, soil, &c. of the country.

Syria is in some measure only a chain of mountains, varying in their levels, situation, and appearances. The part of the country, however, next the sea is in general low, and besides this there are several extensive valleys. The climate on the sea-coast and in these valleys is very hot, but in the higher parts of the country it bears a good deal of resemblance to that of France. Syria is exceedingly fertile, and the variety of its productions is very great. Besides wheat, rye, barley, beans, and the cotton plant, which is cultivated everywhere, Palestine abounds in sesamum, from which oil is procured, and doura as good as that of Egypt. Maize thrives in the light soil of Balbec, and even rice is cultivated with success on the borders of the marshy country of Havula. They have lately begun to plant sugarcanes in the gardens of Saide and of Bairout, and they find them equal to those of the Delta. Indigo grows without cultivating on the banks of the Jordan, in the country of Bisan, and only requires care to make it of an excellent quality. The hill-sides of Latakia produce tobacco. Gaza produces dates like Mecca, and pomegranates like Algiers; Tripoli affords oranges equal to those of Malta; Bairout figs like those of Marseilles, and bananas not inferior to those of St Domingo; Aleppo enjoys the exclusive advantage of producing pistachios; and Damascus justly boasts of possessing all the fruits known in France. Its stony soil suits equally the apples of Normandy, the plums of Touraine, and the peaches of Paris.

Volney's Travels, vol. i.

Paris. Twenty ſorts of apricots are reckoned there, the ſtone of one of which contains a kernel highly valued through all Turkey. The cochineal plant, which grows on all that coaſt, contains perhaps that precious inſect in as high perfection as it is found in Mexico and St Domingo.

The inhabitants may be divided into three principal claſſes: the deſcendants of the Greeks of the Lower Empire; the Arabs, their conquerors; and the Turks, the preſent ruling power: and theſe again, the firſt into three, the ſecond into four, claſſes; beſides three wandering tribes of Turkomans, Curds, and Bedouin Arabs. The ancient inhabitants before the Greeks under Alexander are entirely loſt. The inhabitants are in general of a middling ſtature, and the eyes of the women almoſt everywhere beautiful, and their ſhape correct and well proportioned. The general language is Arabic.

SYRINGA, the LILAC, a genus of plants belonging to the claſs diandria, and in the natural ſyſtem ranging under the 44th order, *Sepiariæ*. See BOTANY *Index*.

SYRINGE, a well-known inſtrument, ſerving to imbibe or ſuck in a quantity of fluid, and to ſquirt or expel the ſame with violence. The word is formed from the Greek συριγξ, or the Latin *ſyrinx* "a pipe." —A ſyringe is only a ſingle pump, and the water aſcends in it on the ſame principle as in the common ſucking-pump. See HYDRODYNAMICS.

SYRUP, in *Pharmacy*, a ſaturated ſolution of ſugar, made in vegetable decoctions or infuſions. See MATERIA MEDICA.

SYSTEM, in general, denotes an aſſemblage or chain of principles and concluſions, or the whole of any doctrine, the ſeveral parts whereof are bound together, and follow or depend on each other; in which ſenſe we ſay a *ſyſtem of philoſophy*, *ſyſtem of divinity*, *&c.* The word is formed from the Greek συστημα "compoſition, compages."

SYSTEM, in the animal economy, the *vaſcular*, the *nervous*, and the *cellular*. See ANATOMY.

SYSTEM, in *Muſic*, an aſſemblage of the rules for harmony, deduced from ſome common principle by which they are reunited; by which their connection one with another is formed; from whence, as from their genuine ſource, they natively flow; and to which, if we would account for them, we muſt have recourſe. See the articles CHROMATIC, DIATONIC, ENHARMONIC, HARMONY, INTERVAL, and MUSIC.

SYSTEM, in *Botany*. See BOTANY.

SYSTEM, in *Aſtronomy*. See ASTRONOMY.

SYSTOLE, in *Anatomy*, the contraction of the heart, whereby the blood is drawn off its ventricles into the arteries; the oppoſite ſtate to which is called the *diaſtole*, or *dilatation of the heart*. See ANATOMY *Index*.

SYSTYLE, in *Architecture*, that manner of placing columns where the ſpace between the two ſhafts conſiſts of two diameters or four modules.

SYZYGY, SYZYGIA, in *Aſtronomy*, a term equally uſed for the conjunction and oppoſition of a planet with the ſun. The word is formed from the Greek συζυγια, which properly ſignifies *conjunctio*. On the phenomena and circumſtances of the ſyzygies a great part of the lunar theory depends. See ASTRONOMY.

T.

T, or t, the 19th letter and 16th conſonant of our alphabet; the ſound whereof is formed by a ſtrong expulſion of the breath through the mouth, upon a ſudden drawing back of the tongue from the fore-part of the palate, with the lips at the ſame time open. The proper ſound of *t* is expreſſed in moſt words beginning or ending with that letter; as in *take*, *tell*, *hot*, *put*. *Ti* before a vowel has the ſound of *ſi*, or rather of *ſhi*, as in *creation*, except when *ſ* precedes, as in *queſtion*; and in derivatives from words ending in *ty*, as *mighty*, *mightier*. *Th* has two ſounds; the one ſoft, as *thou*, *father*; the other hard, as *thing*, *think*. The ſound is ſoft in theſe words, *then*, *thence*, and *there*, with their derivatives and compounds; and in the words *that*, *this*, *thus*, *thy*, *they*, *though*; and in all words in which *th* comes between two vowels, as, *whether*, *rather*; and between *r* and a vowel, as *burthen*.

In abbreviations, amongſt the Roman writers, T. ſtands for *Titus*, *Titius*, &c.; Tab. for *Tabularius*; Tab. P. H. C. *Tabularius Provinciæ Hiſpaniæ Citerioris*; Tar. *Tarquinius*; Ti. *Tiberius*; Ti. F. *Tiberii filius*; Ti. L. *Tiberii libertus*: Ti. N. *Tiberii Nepos*; T. J. A. V. P. V. D. *tempore judicem arbitrumve poſtulat ut det*; T. M. P. *terminum poſuit*; T. M. D. D. *terminum dedicavit*; Tr. *trans*, *tribunus*; Tr. M. or Mil. *tribunus militum*; TR. PL. DES. *tribunus plebis deſignatus*; TR. AER. *tribunus ærarii*; TRV. CAP. *triumviri capitales*; T. P. or TRIB. POT. *tribunicia poteſtate*; Tul. H. *Tullus Hoſtilius*.

Amongſt the ancients, T, as a numeral, ſtood for *one hundred and ſixty*; and with a daſh at top, thus, $\overline{T}$, it ſignified *one hundred and ſixty thouſand*. In muſic, T ſtands for *tutti*, "all, or altogether."

TABANUS, the BREEZE-FLY; a genus of inſects belonging to the order of diptera. See ENTOMOLOGY *Index*.

TABARCA, a ſmall iſland lying oppoſite to a town of the ſame name, which divides the maritime coaſts of Tunis and Algiers, in Africa. It is two miles from the land, and is in poſſeſſion of the noble family of the Lamellini of Genoa, who have here a governor and a garriſon of 200 men to protect the coral fiſhery. N. Lat. 36. 50. E. Long. 9. 16.

TABASHEER, a Perſian word, ſignifying a hard ſubſtance found in the cavities of the bamboo or Indian reed, and highly valued as a medicine in the Eaſt Indies.

Tabasheer. Though some account was given of the tabasheer by the Arabian physicians, no accurate knowledge of it was obtained till Dr Russel favoured the public with his observations on it.

The tabasheer is produced from the female bamboo, which is distinguished from the male by a larger cavity. The bamboos containing it, make a rattling noise when shaken. Dr Russel having examined a bamboo brought from Vellore, consisting of six joints, found no tabasheer in two of them: all the rest contained some, but of various quality and quantity; the whole amounting to about 27 grains. The best was of a bluish white resembling small fragments of shells, harder also than the rest, but which might be easily crumbled between the fingers into a gritty powder; and when applied to the tongue and palate, had a slight saline and testaceous taste; the weight not exceeding four grains. The colour of the rest was cineritious, rough on the surface, and more friable; having some particles of a larger size intermixed, but light, spongy, and somewhat resembling pumice stones; which appearance, our author supposes, led the Arabians to think that fire was concerned in the production. The two middle joints were of a pure white colour within, and lined with a thin film. In these the tabasheer was principally found. The other joints, particularly the two upper ones, were discoloured within; and in some parts of the cavity was found a blackish substance in grains or in powder, adhering to the sides, the film being there obliterated. In two or three of the joints a small round hole was found at top and bottom, which seemed to have been perforated by some insect.

Garzius informs us, that it is not found in all bamboos, or in all the branches indiscriminately, but only in those growing about Bisnagur, Batecala, and one part of the Malabar coast. Dr Russel was informed by a letter from a medical gentleman attending the embassy to the Nizam, that though tabasheer bears a high price at Hydrabad, it is never brought thither from Bisnagur; and that some of what is sold in the markets comes from the pass of Atcour in Canoul; and some from Emnabad, at the distance of about 80 miles to the north-west; but that the most part comes from Masulipatam. That sold in the markets is of two kinds; one the rate of a rupee per dram, but the other only half that price; the latter, however, is supposed to be factitious, and made up mostly of burnt teeth and bones. Dr Russel himself also, is persuaded that the tabasheer met with in commerce is greatly adulterated. The above-mentioned gentleman likewise informed the doctor that tabasheer was produced in great quantities at Sylhat, where it is sold by the pound, from one rupee to one and an half; forming a considerable article of trade from Bengal to Persia and Arabia. There is, however, a third kind, much superior in quality, being whiter, purer, and also harder and heavier.

Dr Russel supposes that the tabasheer is the juice of the bamboo thickened and hardened. The following observations on its medical effects were taken from a Persian work, intitled the "Tofut ul Monein of Mahommed Monein Hoseiny," by Mr Williams, a surgeon in the service of the East India company. The tabasheer puts a stop to bilious vomitings and to the bloody flux. It is also of service in cases of palpitation of the heart, in faintings, and for strengthening those members of the body that are weakened by heat. It is useful also for the piles, and for acute or burning fevers, and for pustules in the mouth (thrush); and, given with oxymel, is of service against restlessness, melancholy, and hypochondriacal affections. The habitual internal use of it is prejudicial to the virile powers. It is also said to be prejudicial to the lungs. Its correctives are the gum of the pine and honey. The dose of it is to the weight of two d'herems, or seven mashás. Tabasheer || Tabernæmontana.

TABBY, in *Commerce*, a kind of rich silk which has undergone the operation of tabbying.

TABBYING, the passing a silk or stuff under a callender, the rolls of which are made of iron or copper variously engraven, which bearing unequally on the stuff renders the surface thereof unequal, so as to reflect the rays of light differently, making the representation of waves thereon.

TABELLIO, in the Roman law, an officer or scrivener, much the same with our notaries public, who are often called *tabelliones*.

TABERNACLE, among the Hebrews, a kind of building, in the form of a tent, set up, by express command of God, for the performance of religious worship, sacrifices, &c. during the journeying of the Israelites in the wilderness: and, after their settlement in the land of Canaan, made use of for the same purpose till the building of the temple of Jerusalem. It was divided into two parts; the one covered, and properly called the *tabernacle*; and the other open, called the *court*. The curtains which covered the tabernacle were made of linen, of several colours, embroidered. There were ten curtains, 28 cubits long and four in breadth. Five curtains fastened together made up two coverings, which covered up all the tabernacle. Over these there were two other coverings; the one of goat's hair, the other of sheep's skins. The holy of holies was parted from the rest of the tabernacle by a curtain made fast to four pillars, standing ten cubits from the end. The length of the whole tabernacle was 32 cubits, that is, about 50 feet; and the breadth 12 cubits or 19 feet. The court was a spot of ground 100 cubits long, and 50 in breadth, enclosed by 20 columns, each 20 cubits high and 10 in breadth, covered with silver, and standing on copper bases, five cubits distant from one another; between which there were curtains drawn, and fastened with hooks. At the east end was an entrance, 20 cubits wide, covered with a curtain hanging loose.

Feast of TABERNACLES, a solemn festival of the Hebrews, observed after harvest, on the 15th day of the month Tisri, instituted to commemorate the goodness of God, who protected the Israelites in the wilderness, and made them dwell in booths, when they came out of Egypt. On the first day of the feast, they began to erect booths of the boughs of trees, and in these they were obliged to continue seven days. The booths were placed in the open air, and were not to be covered with cloths, nor made too close by the thickness of the boughs; but so loose that the sun and the stars might be seen, and the rain descend through them. For further particulars of the celebration of this festival, see LEVIT. ch. xxiii.

TABERNÆ, in *Ancient Geography*. See *TRES Tabernæ*.

TABERNÆMONTANA, in *Botany*, a genus of plants belonging to the class of pentandria, and order of monogynia; and in the natural system arranged under the

the 30th order, *Contortæ*. There are two horizontal follioles, and the feeds are immerfed in pulp. There are eight fpecies, all of foreign growth.

TABLE, a moveable piece of furniture, ufually made of wood or ftone, and fupported on pillars or the like, for the commodious reception of things placed thereon.

TABLE is alfo ufed for the fare or entertainment ferved up.

TABLE, in *Mathematics*, fyftems of numbers calculated to be ready at hand for the expediting aftronomical, geometrical, and other operations.

TABLE-Book. See WRITING.

TABLE-Mountain, a mountain of Africa, being the moft weftcrly cape or promontory in that part of the world, and near the Cape of Good Hope. The bay which is formed thereby is called the *Table-bay*.

Laws of the Twelve TABLES, were the firft fet of laws of the Romans; thus called either becaufe the Romans then wrote with a ftyle on thin wooden tablets covered with wax; or rather, becaufe they were engraved on tables or plates of copper, to be expofed in the moft noted part of the public forum. After the expulfion of the kings, as the Romans were then without any fixed or certain fyftem of law, at leaft had none ample enough to take in the various cafes that might fall between particular perfons, it was refolved to adopt the beft and wifeft laws of the Greeks. One Hermodorus was firft appointed to tranflate them, and the decemviri afterwards compiled and reduced them into ten tables. After a world of care and application, they were at length enacted and confirmed by the fenate and an affembly of the people, in the year of Rome 303. The following year they found fomething wanting therein, which they fupplied from the laws of the former kings of Rome, and from certain cuftoms which long ufe had authorifed: all thefe being engraven on two other tables, made the law of the twelve tables, fo famous in the Roman jurifprudence, the fource and foundation of the civil or Roman law.

TABLES of the Law, in Jewifh antiquity, two tables on which were written the decalogue, or ten commandments, given by GOD to Mofes on Mount Sinai.

TABOO, a word ufed by the South fea iflanders, nearly of the fame import as prohibited or interdicted. It applies equally to perfons and things, and is alfo expreffive of any thing facred, devoted, or eminent.

TABOR, a mountain of Galilee, about 12 miles from the city of Tiberias. It rifes in the form of a fugar loaf, in the midft of an extenfive plain, to the height of 30 ftadia, according to Jofephus. The afcent is fo eafy, that one may afcend on horfeback. On the top there is a plain two miles in circumference.

The fituation of Mount Tabor is moft delightful. Rifing amidft the plains of Galilee, it exhibits to the enchanted eye a charming variety of profpects. On one fide there are lakes, rivers, and a part of the Mediterranean; and on the other a chain of little hills, with fmall valleys, fhaded by natural groves, and enriched by the hands of the hufbandman with a great number of ufeful productions. Here you behold an immenfity of plains interfperfed with hamlets, fortreffes, and heaps of ruins; and there the eye delights to wander over the fields of Jezrael or Mageddon, named by the Arabs *Ebn-Aamer*, which fignifies "the field of the fons of Aamer." A little farther you diftinguifh the mountains of Hermon, Gilboa, Samaria, and Arabia the Stony. In fhort, you experience all thofe fenfations which are produced by a mixture and rapid fucceffion of rural, gay, gloomy, and majeftic objects.

Mariti's Travels, vol. ii.

It was upon this enchanting mount that the apoftle Peter faid to Chrift, "It is good for us to be here: and let us make three tabernacles; one for thee, and one for Mofes, and one for Elias."

Flavian Jofephus, governor of Galilee, caufed the fummit of this mountain, for the fpace of two miles and a half, to be furrounded with walls. The inhabitants of Tabor long braved the power of the Roman armies; but being deprived of water in confequence of the great heats, they were forced to furrender at difcretion to Placidus, the general of Vefpafian.

Several churches were built upon this mountain by St Helen, who founded here alfo fome monafteries. Of the two moft remarkable, one was dedicated to Mofes, and inhabited by Cenobites of the order of St Benedict, who followed the Latin rites: the other was dedicated to the prophet Elias by monks of the order of St Bafil, attached to the Greek rites. The kings of Hungary erected here alfo a pretty fpacious convent for fome monks belonging to that nation, of the order of St Paul the firft hermit. Tabor was alfo the feat of a bifhop, dependant on the patriarchate of Jerufalem.

When Godfrey of Bouillon feized on this mountain, he repaired the ancient churches, which were beginning to fall into ruins. Under Baldwin I. in 1113, the Saracen troops retook Tabor; and their fanguinary fury gained as many victories as there were priefts and Cenobites. This mountain again fell into the hands of the Chriftians; but the Catholic ftandard was not long difplayed on it. Saladin pulled it down the year following, and deftroyed all the churches. The Chriftians retook it once more in 1253; and their zeal made them rebuild all the facred places. At this time Rome being accuftomed to give away empires, Pope Alexander IV. granted Tabor to the Templars, who fortified it again. At length, in the courfe of the year 1290, the fultan of Egypt deftroyed and laid wafte the buildings of this mountain, which could never be repaired afterwards; fo that at prefent it is uninhabited.

TACAMAHACA, in *Pharmacy*, a gum refin, obtained from the Fagara octandra and populus balfamifera; and having a fragrant fmell, a bitterifh naufeous tafte, and fuppofed to be ftimulant and tonic in its effects.

TACCA, a genus of plants belonging to the clafs dodecandria. See BOTANY *Index*.

TACHYGRAPHY, from ταχυς, *fhort*, and γραφω, *I write*, or the art of writing fhort-hand. See STENOGRAPHY.

TACITUS, CAIUS CORNELIUS, a celebrated Roman hiftorian, and one of the greateft men of his time, appears to have been born about the year of Rome 809 or 810, and applied himfelf early to the labours of the bar, in which he gained very confiderable reputation. Having married the daughter of Agricola, the road to public honours was laid open to him in the reign of Vefpafian; but during the fanguinary and capricious tyranny of Domitian, he, as well as his friend Pliny, appears to have retired from the theatre of public affairs. The reign of Nerva reftored thefe luminaries of Roman literature to the metropolis, and we find Tacitus engaged, in A. U. C. 850, to pronounce the funeral oration

Murphy's Tranflation of Tacitus.

oration of the venerable Virginius Rufus, the colleague of the emperor in the consulship, and afterwards succeeding him as consul for the remainder of the year.

The time of his death is not mentioned by any ancient author, but it is probable that he died in the reign of Trajan.

His works which still remain are, 1. Five books of his History. 2. His Annals. 3. A Treatise on the different Nations which in his time inhabited Germany: and, 4. The Life of Agricola his father-in-law. There is also attributed to him a Treatise on Eloquence, which others have ascribed to Quintilian. The Treatise on the Manners of the Germans was published in 851.—In the year 853, Pliny and Tacitus were appointed by the senate to plead the cause of the oppressed Africans against Marius Priscus, a corrupt proconsul, who was convicted before the fathers; and the patriot orators were honoured with a declaration that they had executed their trust to the entire satisfaction of the house. The exact time when Tacitus published his history is uncertain, but it was in some period of Trajan's reign, who died suddenly, A. U. C. 870, A. D. 117.—The history comprises a period of 27 years, from the accession of Galba, 822, to the death of Domitian, 849. The history being finished, he did not think he had completed the tablature of slavery; he went back to the time of Tiberius: and the second work, which, however, comes first in the order of chronology, includes a period of 54 years, from the accession of Tiberius, 767, to the death of Nero, 821: this work is his "Annals."

Biographical Dictionary.

It is remarkable, that princes and politicians have always held the works of Tacitus in the highest esteem; which looks as if they either found their account in reading them, or were pleased to find courts, and the people who live in them, so exactly described after the life as they are in his writings. Part of what is extant was found in Germany by a receiver of Pope Leo X. and published by Beroaldus at Rome in 1515. Leo was so much charmed with Tacitus, that he gave the receiver a reward of 500 crowns; and promised not only indulgences, but money also and honour, to any one who should find the other part; which it is said was afterwards brought to him. Pope Paul III. as Muretus relates, wore out his Tacitus by much reading it; and Cosmo de Medicis, who was the first great duke of Tuscany, and formed for governing, accounted the reading of him his greatest pleasure. Muretus adds, that several princes, and privy-counsellors to princes, read him with great application, and regarded him as a sort of oracle in politics. A certain author relates, that Queen Christina of Sweden, though extremely fond of the Greek tongue, which she made "the diversion of her leisure hours, was not restrained by that from her serious studies; so she called among others Tacitus's History, some pages of which she read constantly every day." Lastly, Lord Bolingbroke, an authority surely of no mean rank, calls him, "a favourite author," and gives him manifestly the preference to all the Greek and Roman historians.

Baillet Vie de Des Cartes, tom. ii. *Study of History*, Letter v.

No author has obtained a more splendid reputation than Tacitus. He has been accounted, and with good reason, the most cultivated genius of antiquity; and we must not seek for his parallel in modern times. It is impossible not to admire and recommend his intimate knowledge of the human heart, the spirit of liberty which he breathes, and the force and vivacity with which he perpetually expresses himself. The reader of taste is struck by the greatness of his thoughts and the dignity of his narration; the philosopher by the comprehensive powers of his mind; and the politician by the sagacity with which he unfolds the springs of the most secret transactions. Civil liberty and the rights of mankind never met with a bolder or a more able assertor: servitude, debasement, and tyranny, appear not in the writings of any other author in juster or more odious colours. He has been censured as obscure; and indeed nothing can be more certain than that he did not write for the common mass of men. But to those who are judges of his compositions, it is no matter of regret that his manner is his own, and peculiar. Never were description and sentiment so wonderfully and so beautifully blended; and never were the actions and characters of men delineated with so much strength and precision. He has all the merits of other historians, without their defects. He possesses the distinctness of Xenophon without his uniformity; he is more eloquent than Livy, and is free from his superstition; and he has more knowledge and judgment than Polybius, without his affectation of reasoning on every occasion.

One of the best editions of the works of Tacitus was published at Paris by Brotier, in 4 vols. 4to. There have been four translations of his works into English; the first by Greenway and Sir Henry Saville, in the reign of Elizabeth; the second by Dryden and others; the third by Gordon, which is remarkable for affectation of style, though some think it bears a striking resemblance to the original; and the fourth and best by Murphy, in 1793, in 4 vols. 4to.

TACK, a rope used to confine the foremost lower corners of the courses and stay-sails in a fixed position, when the wind crosses the ship's course obliquely. The same name is also given to the rope employed to pull out the lower corner of a studding-sail or driver to the extremity of its boom.

The main-sail and fore-sail of a ship are furnished with a tack on each side, which is formed of a thick rope tapering to the end, and having a knot wrought upon the largest end, by which it is firmly retained in the clue of the sail. By this means one tack is always fastened to windward, at the same time that the sheet extends the sail to the leeward.

TACK, is also applied, by analogy, to that part of any sail to which the tack is usually fastened.

A ship is said to be on the starboard or larboard tack, when she is close-hauled, with the wind upon the starboard or larboard side; and in this sense the distance which she sails in that position is considered as the length of the tack; although this is more frequently called *board*. See that article.

To TACK, to change the course from one board to another, or turn the ship about from the starboard to the larboard tack, in a contrary wind. Thus a ship being close-hauled on the larboard tack, and turning her prow suddenly to windward, receives the impression of the wind on her head-sails, by which she falls off upon the line of the starboard-tack. Tacking is also used in a more enlarged sense, to imply that manœuvre in navigation by which a ship makes an oblique progression to the windward, in a zig-zag direction. This, however, is more usually called *beating*, or *turning to windward*.

Falconer's Marine Dictionary.

ward. See NAVIGATION, SAILING, and *Naval Tactics*, under WAR.

TACK, in *Scots Law.* See LAW, N° clxvii.

TACKLE, among ſeamen, denotes all the ropes or cordage of a ſhip uſed in managing the ſails, &c.

TACKSMAN. See TENURE.

TACTICS, in the art of war, is the method of diſpoſing forces to the beſt advantage in order of battle, and of performing the ſeveral military motions and evolutions. See WAR.

TADCASTER, a town in the weſt riding of Yorkſhire, noted for the great plenty of limeſtone dug up near it; and for being one of the firſt places in which a building was erected for Sunday ſchools. It is nine miles from York, and 188 from London.

TADMOR. See PALMYRA.

TADPOLE, a young frog before it has diſengaged itſelf from the membranes that envelope it in its firſt ſtage of life. See ERPETOLOGY, p. 281.

TÆNIA, a genus of animals belonging to the claſs of *vermes*. See HELMINTHOLOGY, N° 29, 30.

TAFFETY, or TAFFETA, in *Commerce*, a fine ſmooth ſilken ſtuff, remarkably gloſſy. There are taffeties of all colours, ſome plain, and others ſtriped with gold, ſilver, &c. others chequered, others flowered, &c. according to the fancy of the workmen.

TAGANROK, or TAGANROG, a ſea-port town ſituated at the head of the ſea of Azof, and forming one of the principal ports of the Ruſſian empire. It ſtands on a ſmall promontory, at the extremity of which is a fortreſs of conſiderable ſtrength, and capable of accommodating a numerous garriſon. The ſtreets are wide but unpaved, and from the lightneſs of the ſoil, are either intolerably duſty, or ankle deep in mud. The houſes, which do not exceed a thouſand, are ſmall, built chiefly of wood, plaiſtered with mud, and roofed with bark. It is in north latitude 46°.

Taganrok is remarkable only as a place of trade, but in this view is highly reſpectable. When Mr M'Gill viſited it in 1805, he found there upwards of 200 veſſels of various ſizes, waiting for cargoes. From its advantageous ſituation, at the head of the ſea of Azof, and near the mouths of the rivers Don and Volga, and from its being in the vicinity of a very fertile country, it has become the centre of commerce for many ſtaple articles. Hither are brought, for exportation, vaſt quantities of grain, wool, hides, butter, tallow, bees-wax and honey from the ſouthern provinces of Ruſſia; iron, timber, pitch, and tar from Siberia; caviar to the amount of 50,000 puds annually from the Don and the Volga; hemp and flax from the neighbouring diſtricts. Cordage and canvas are manufactured here, and form a conſiderable article of traffic. The trade is carried on chiefly by Raguſan and Greek ſupercargoes, who remain only till their commodities are collected and ſhipped. For the beſt accounts of this place, ſee Pallas's *Travels in the Ruſſian Empire*, and M'Gill's *Travels in Turkey, Italy, and Ruſſia.*

TAGARA, a city of ancient India, the metropolis of a large diſtrict called *Ariaca*, which comprehended the greateſt part of the Subah of Aurungabad, and the ſouthern part of Concan. Arrian ſays, that it was ſituated about ten days journey to the eaſtward of Pultanah; which, according to the rate of travelling in that country with loaded carts, might be about 100 Britiſh miles. This fixes its ſituation at Deoghir, a place of great antiquity, and famous through all India on account of the pagodas of Elouſa. It is now called *Doulet-abad.*

TAGETES, MARYGOLD, a genus of plants belonging to the claſs ſyngeneſia; and in the natural ſyſtem ranging under the 49th order, *Compoſitæ.* See BOTANY *Index.*

TAGUS, the largeſt river of Spain; which, taking its riſe on the confines of Arragon, runs ſouth-weſt through the provinces of New Caſtile and Eſtremadura; and paſſing by the cities of Aranjuez, Toledo, and Alcantara, and then croſſing Portugal, forms the harbour of Liſbon, at which city it is about three miles over; and about eight or ten miles below this it falls into the Atlantic ocean.

TAHOEREWA, one of the Sandwich iſlands, is ſmall, deſtitute of wood, the ſoil ſandy and unfertile; is ſituated in north latitude 20° 38′, in eaſt longitude 203° 27′.

TAHOORA, one of the Sandwich iſlands in the South Sea. It is uninhabited, and lies in north latitude 21° 43′. and in eaſt longitude 199° 36′. See *SANDWICH-Iſlands.*

TAJACU, or PECCARY, in *Zoology*, a ſpecies of hog. See SUS, MAMMALIA *Index.*

TAI-OUAN, the Chineſe name of the iſland of Formoſa. See FORMOSA.—Tai-ouan is alſo the name of the capital of the iſland.

TAIL, the train of a beaſt, bird, or fiſh; which in land animals, it is ſaid, ſerves to drive away flies, &c. and in birds and fiſhes to direct their courſe, and aſſiſt them in aſcending or deſcending in the air or water. But the tail in all animals is of great uſe in directing their motions.

TAIL, or FEE-TAIL, in *Law*, is a conditional eſtate or fee, oppoſed to *fee-ſimple.* See FEE.

A conditional fee, at the common law, was a fee reſtrained to ſome particular heirs excluſive of others; as to the heirs of a man's body, by which only his lineal deſcendants were admitted, in excluſion of collateral heirs; or to the heirs male of his body, in excluſion both of collaterals and lineal females alſo. It was called a *conditional fee*, by reaſon of the condition expreſſed or implied in the donation of it, that if the donee died without ſuch particular heirs, the land ſhould revert to the donor. For this was a condition annexed by law to all grants whatſoever, that on failure of the heirs ſpecified in the grant, the grant ſhould be at an end, and the land return to its ancient proprietor. Such conditional fees were ſtrictly agreeable to the nature of feuds, when they firſt ceaſed to be mere eſtates of life, and were not yet arrived to be abſolute eſtates in fee-ſimple.

With regard to the condition annexed to theſe fees by the common law, it was held, that ſuch a gift (to a man and the heirs of his body) was a gift upon condition that it ſhould revert to the donor if the donee had no heirs of his body; but if he had, it ſhould then remain to the donee. They therefore called it a *fee-ſimple* on condition that he had iſſue. Now we muſt obſerve, that when any condition is performed, it is thenceforth entirely gone; and the thing to which it was before annexed becomes abſolute and wholly unconditional. So that as ſoon as the grantee had any iſſue born, his

his eſtate was ſuppoſed to become abſolute by the performance of the condition; at leaſt for theſe three purpoſes: 1. To enable the tenant to alienate the land, and and thereby to bar not only his own iſſue, but alſo the donor, of his intereſt in the reverſion. 2. To ſubject him to forfeit it for treaſon: which he could not do till iſſue born longer than for his own life, leſt thereby the the inheritance of the iſſue and reverſion of the donor might have been defeated. 3. To empower him to charge the land with rents, commons, and certain other encumbrances, ſo as to bind his iſſue. And this was thought the more reaſonable, becauſe, by the birth of iſſue, the poſſibility of the donor's reverſion was rendered more diſtant and precarious: and his intereſt ſeems to have been the only one which the law, as it then ſtood, was ſolicitous to protect, without much regard to the right of ſucceſſion intended to be veſted in the iſſue. However, if the tenant did not in fact alienate the land, the courſe of deſcent was not altered by this performance of the condition: for if the iſſue had afterwards died, and then the tenant or original grantee had died, without making any alienation, the land, by the terms of the donation, could deſcend to none but the heirs of his body; and therefore, in default of them, muſt have reverted to the donor. For which reaſon, in order to ſubject the lands to the ordinary courſe of deſcent, the donees of theſe conditional fee-ſimples took care to alienate as ſoon as they had performed the condition by having iſſue; and afterwards repurchaſed the lands, which gave them a fee ſimple abſolute, that would deſcend to the heirs general, according to the courſe of the common law. And thus ſtood the old law with regard to conditional fees: which things, ſays Sir Edward Coke, though they ſeem ancient, are yet neceſſary to be known, as well for the declaring how the common law ſtood in ſuch caſes, as for the ſake of annuities, and ſuch-like inheritances, as are not within the ſtatutes of entail, and therefore remain as the common law. The inconveniences which attended theſe limited and fettered inheritances were probably what induced the judges to give way to this ſubtle fineſſe (for ſuch it undoubtedly was), in order to ſhorten the duration of theſe conditional eſtates. But, on the other hand, the nobility, who were willing to perpetuate their poſſeſſions in their own families, to put a ſtop to this practice, procured the ſtatute of Weſtminſter the ſecond (commonly called the ſtatute *de donis conditionalibus*) to be made; which paid a greater regard to the private will and intentions of the donor, than to the propriety of ſuch intentions, or any public conſiderations whatſoever. This ſtatute revived in ſome ſort the ancient feodal reſtraints which were originally laid on alienations, by enacting, that from thenceforth the will of the donor be obſerved; and that the tenements ſo given (to a man and the heirs of his body) ſhould at all events go to the iſſue, if there were any; or if none, ſhould revert to the donor.

Upon the conſtruction of this act of parliament, the judges determined that the donee had no longer a conditional fee-ſimple, which became abſolute and at his own diſpoſal the inſtant any iſſue was born; but they divided the eſtate into two parts, leaving in the donee a new kind of particular eſtate, which they denominated a *fee-tail*; and veſting in the donor the ultimate fee-ſimple of the land, expectant on the failure of iſſue; which expectant eſtate is what we now call a *reverſion*. And hence it is that Littleton tells us, that tenant in fee-tail is by virtue of the ſtatute of Weſtminſter the ſecond. The expreſſion *fee-tail*, or *feodum talliatum*, was borrowed from the feudiſts (ſee Crag. *l. s. t.* 10. § 24, 25.), among whom it ſignified any mutilated or truncated inheritance, from which the heirs general were cut off; being derived from the barbarous verb *taliare*, to cut; from which the French *tailler* and the Italian *tagliare* are formed, (Spelm. *Gloſſ.* 531.).

Having thus ſhown the original of eſtates tail, we now proceed to conſider what things may or may not be entailed under the ſtatute *de donis*. Tenements is the only word uſed in the ſtatute: and this Sir Edward Coke expounds to comprehend all corporeal hereditaments whatſoever: and alſo all incorporeal hereditaments which ſavour of the reality, that is, which iſſue out of corporeal ones, or which concern or are annexed to or may be exerciſed within the ſame; as rents, eſtovers, commons, and the like. Alſo offices and dignities, which concern lands, or have relation to fixed and certain places, may be entailed. But mere perſonal chattels, which ſavour not at all of the reality, cannot be entailed. Neither can an office, which merely relates to ſuch perſonal chattels; nor an annuity, which charges only the perſon, and not the lands of the granter. But in theſe laſt, if granted to a man and the heirs of his body, the grantee hath ſtill a fee conditional at common law as before the ſtatute, and by his alienation may bar the heir or reverſioner. An eſtate to a man and his heirs for another's life cannot be entailed; for this is ſtrictly no eſtate of inheritance, and therefore not within the ſtatute *de donis*. Neither can a copyhold eſtate be entailed by virtue of the ſtatute; for that would tend to encroach upon and reſtrain the will of the lord; but, by the ſpecial cuſtom of the manor, a copyhold may be limited to the heirs of the body; for here the cuſtom aſcertains and interprets the lord's will.

As to the ſeveral ſpecies of eſtates-tail, and how they are reſpectively created; they are either general or ſpecial. Tail-general is where lands and tenements are given to one, and the heirs of his body begotten: which is called *tail-general*; becauſe, how often ſoever ſuch donee in tail be married, his iſſue in general, by all and every ſuch marriage, is, in ſucceſſive order, capable of inheriting the eſtate-tail *per formam doni*. Tenant in *tail-ſpecial* is where the gift is reſtrained to certain heirs of the donee's body, and does not go to all of them in general. And this may happen ſeveral ways. We ſhall inſtance in only one; as where lands and tenements are given to a man and the heirs of his body, on Mary his now wife to be begotten. Here no iſſue can inherit but ſuch ſpecial iſſue as is engendered between them two; not ſuch as the huſband may have by another wife; and therefore it is called *ſpecial tail*. And here we may obſerve, that the words of inheritance (to him and his heirs) give him an eſtate in fee; but they being heirs to be by him begotten, this makes it a fee tail; and the perſon being alſo limited, on whom ſuch heirs ſhall be begotten (viz. Mary his preſent wife), this makes it a fee-tail ſpecial.

Eſtates in general and ſpecial tail are farther diverſified by the diſtinction of ſexes in ſuch entails; for both of them may either be in tail male or tail female. As

Tail.

if lands be given to a man, and his heirs-male of his body begotten, this is an eſtate in tail male general; but if to a man, and the heirs-female of his body on his preſent wife begotten, this is an eſtate in tail female ſpecial. And in caſe of an entail male, the heirs-female ſhall never inherit, nor any derived from them; nor, *è converſo*, the heirs-male in caſe of a gift in tail female. Thus, if the donee in tail male hath a daughter, who dies leaving a ſon, ſuch grandſon in this caſe cannot inherit the eſtate-tail; for he cannot deduce his deſcent wholly by heirs-male. And as the heir-male muſt convey his deſcent wholly by males, ſo muſt the heir-female wholly by females. And therefore if a man hath two eſtates-tail, the one in tail male and the other in tail female, and he hath iſſue a daughter, which daughter hath iſſue a ſon; this grandſon can ſucceed to neither of the eſtates, for he cannot convey his deſcent wholly either in the male or female line.

As the word *heirs* is neceſſary to create a fee, ſo, in farther imitation of the ſtrictneſs of the feodal donation, the word *body*, or ſome other words of procreation, are neceſſary to make it a fee-tail, and aſcertain to what heirs in particular the fee is limited. If, therefore, either the words of inheritance or words of procreation be omitted, albeit the others are inſerted in the grant, this will not make an eſtate-tail. As if the grant be to a man and the iſſue of his body, to a man and his ſeed, to a man and his children or offſpring; all theſe are only eſtates for life, there wanting the words of inheritance, "his heirs." So, on the other hand, a gift to a man, and his heirs male or female, is an eſtate in fee-ſimple and not in fee-tail; for there are no words to aſcertain the body out of which they ſhall iſſue. Indeed, in laſt wills and teſtaments, wherein greater indulgence is allowed, an eſtate-tail may be created by a deviſe to a man and his ſeed, or to a man and his heirs-male, or by other irregular modes of expreſſion.

There is ſtill another ſpecies of entailed eſtates, now indeed grown out of uſe, yet ſtill capable of ſubſiſting in law; which are eſtates *in libero maritagio*, or FRANK-MARRIAGE. See that article.

The incidents to a tenancy in tail, under the ſtatute Weſtminſter 2. are chiefly theſe: 1. That a tenant in tail may commit waſte on the eſtate-tail, by felling timber, pulling down houſes, or the like, without being impeached or called to account for the ſame. 2. That the wife of the tenant in tail ſhall have her dower, or thirds, of the eſtate-tail. 3. That the huſband of a female tenant in tail may be tenant by the curteſy of the eſtate-tail. 4. That an eſtate-tail may be barred, or deſtroyed, by a fine, by a common recovery, or by lineal warranty deſcending with aſſets to the heir. See ASSETS.

Thus much for the nature of eſtates-tail: the eſtabliſhment of which family-law (as it is properly ſtyled by Pigott) occaſioned infinite difficulties and diſputes. Children grew diſobedient when they knew they could not be ſet aſide: farmers were ouſted of their leaſes made by tenants in tail; for if ſuch leaſes had been valid, then, under colour of long leaſes, the iſſue might have been virtually diſinherited: creditors were defrauded of their debts; for, if a tenant in tail could have charged his eſtate with their payment, he might alſo have defeated his iſſue, by mortgaging it for as much as it was worth: innumerable latent entails were produced to deprive purchaſers of the lands they had fairly brought; of ſuits in consequence of which, our ancient books are full: and treaſons were encouraged, as eſtates-tail were not liable to forfeiture longer than for the tenant's life. So that they were juſtly branded as the ſource of new contentions and miſchiefs unknown to the common law; and almoſt univerſally conſidered as the common grievance of the realm. But as the nobility were always fond of this ſtatute, becauſe it preſerved their family-eſtates from forfeiture, there was little hope of procuring a repeal by the legiſlature; and therefore, by the connivance of an active and politic prince, a method was deviſed to evade it.

About 200 years intervened betweed the making of the ſtatute *de donis*, and the application of common recoveries to this intent, in the 12th year of Edward IV.; which were then openly declared by the judges to be a ſufficient bar of an eſtate-tail. For though the courts had, ſo long before as the reign of Edward III. very frequently hinted their opinion that a bar might be effected upon theſe principles, yet it was never carried into execution; till Edward IV. obſerving (in the diſputes between the houſes of York and Lancaſter) how little effect attainders for treaſon had on families whoſe eſtates were protected by the ſanctuary of entails, gave his countenance to this proceeding, and ſuffered Taltarum's caſe to be brought before the court: wherein, in conſequence of the principles then laid down, it was in effect determined, that a common recovery ſuffered by tenant in tail ſhould be an effectual deſtruction thereof. Theſe common recoveries are fictitious proceedings, introduced by a kind of *pia fraus*, to elude the ſtatute *de donis*, which was found ſo intolerably miſchievous, and which yet one branch of the legiſlature would not then conſent to repeal; and that theſe recoveries, however clandeſtinely begun, are now become by long uſe and acquieſcence a moſt common aſſurance of lands; and are looked upon as the legal mode of conveyance, by which a tenant in tail may diſpoſe of his lands and tenements: ſo that no court will ſuffer them to be ſhaken or reflected on, and even acts of parliament have by a ſide-wind countenanced and eſtabliſhed them.

This expedient having greatly abridged eſtates-tail with regard to their duration, others were ſoon invented to ſtrip them of other privileges. The next that was attacked was their freedom from forfeitures for treaſon. For, notwithſtanding the large advances made by recoveries, in the compaſs of about threeſcore years, towards unfettering theſe inheritances, and thereby ſubjecting the lands to forfeiture, the rapacious prince then reigning, finding them frequently reſettled in a ſimilar manner to ſuit the convenience of families, had addreſs enough to procure a ſtatute, whereby all eſtates of inheritance (under which general words eſtates-tail were covertly included) are declared to be forfeited to the king upon any conviction of high-treaſon.

The next attack which they ſuffered, in order of time, was by the ſtatute 32 Hen. VIII. c. 28. whereby certain leaſes made by tenants in tail, which do not tend to the prejudice of the iſſue, were allowed to be good in law, and to bind the iſſue in tail. But they received a more violent blow in the ſame ſeſſion of parliament, by the conſtruction put upon the ſtatute of fines, by the ſtatute 32 Hen. VIII. c. 36. which declares a fine duly levied by tenant in tail to be a complete bar to him and his heirs, and all other perſons claiming under ſuch entail.

entail. This was evidently agreeable to the intention of Henry VII. whose policy it was (before common recoveries had obtained their full strength and authority) to lay the road as open as possible to the alienation of landed property, in order to weaken the overgrown power of his nobles. But as they, from the opposite reasons, were not easily brought to consent to such a provision, it was therefore couched, in his act, under covert and obscure expressions. And the judges, though willing to construe that statute as favourably as possible for the defeating of entailed estates, yet hesitated at giving fines so extensive a power by mere implication, when the statute *de donis* had expressly declared that they should not be a bar to estates-tail. But the statute of Henry VIII. when the doctrine of alienation was better received, and the will of the prince more implicitly obeyed than before, avowed and established that intention. Yet, in order to preserve the property of the crown from any danger of infringement, all estates-tail created by the crown, and of which the crown has the reversion, are excepted out of this statute. And the same was done with regard to common recoveries, by the statute 34 and 35 Hen. VIII. c. 20. which enacts, that no feigned recovery had against tenants in tail, where the estate was created by the crown, and the remainder or reversion continues still in the crown, shall be of any force and effect. Which is allowing, indirectly and collaterally, their full force and effect with respect to ordinary estates-tail, where the royal prerogative is not concerned.

Lastly, by a statute of the succeeding yeur, all estates-tail are rendered liable to be charged for payment of debts due to the king by record or special contract; as since, by the bankrupt-laws, they are also subjected to be sold for the debts contracted by a bankrupt. And, by the construction put on the statute 43 Eliz. c. 4. an appointment by tenant in tail of the lands entailed to a charitable use is good without fine or recovery.

Estates-tail being thus by degrees unfettered, are now reduced again to almost the same state, even before issue born, as conditional fees were in at common law, after the condition was performed by the birth of issue. For, first, the tenant in tail is now enabled to alienate his lands and tenements by fine, by recovery, or by certain other means; and thereby to defeat the interest as well of his own issue, though unborn, as also of the reversioner, except in the case of the crown: secondly, he is now liable to forfeit them for high treason: and, lastly, he may charge them with reasonable leases, and also with such of his debts as are due to the crown on specialties, or have been contracted with his fellow-subjects in a course of extensive commerce.

TAILZIE, in *Scots Law*, the same with TAIL. See LAW, N° clxxx. 9.

TALAPOINS or TALOPINS, priests of Siam.—They enjoy great privileges, but are enjoined celibacy and austerity of life, They live in monasteries contiguous to the temples: and what is singular, any one may enter into the priesthood, and after a certain age may quit it to marry, and return to society. There are talapoinesses too, or nuns, who live in the same convents, but are not admitted till they have passed their fortieth year. The talapoins educate children; and at every new and full moon explain the precepts of their religion in their temples; and during the rainy season they preach from six in the morning till noon, and from one in the afternoon till five in the evening. They dress in a very mean garb, go bareheaded and barefooted; and no person is admitted among them who is not well skilled in the Baly language.

They believe that the universe is eternal; but admit that certain parts of it, as this world, may be destroyed and again regenerated. They believe in a universal pervading spirit, and in the immortality and transmigration of the soul; but they extend this last doctrine, not only to all animals, but to vegetables and rocks. They have their good and evil genii, and particular deities, who preside over forests and rivers, and interfere in all sublunary affairs.

For the honour of human nature, we are happy to find so pure a system of morality prevail among these people: It not only forbids its followers to do ill, but enjoins the necessity of doing good, and of stifling every improper thought or criminal desire,

Those who wish to peruse a more particular account of the talapoins, may consult *Voyage de M. de la Loubere;* and Sketches relating to the History, &c. of the Hindoos.

TALC, a species of mineral arranged under the magnesian earths. See MINERALOGY *Index*.

TALENT, signifies both a weight and a coin very common among the ancients, but very different among different nations.

The common Attic talent of weight contains 60 Attic minæ, or 6000 Attic drachmæ; and weighed, according to Dr Arbuthnot, 59 lbs. 11 oz. $17\frac{1}{7}$ gr. English troy weight. There was another Attic talent, by some said to consist of 80, by others of 100 minæ. The Egyptian talent was 80 minæ; the Antiochian also 80; the Ptolemaic of Cleopatra $86\frac{2}{3}$; that of Alexandria 96; and the Insular talent 120. In the valuation of money, the Grecian talent, according to Dr Arbuthnot, was equal to 60 minæ, or, reckoning the mina at 3l. 4s. 7d. equal to 193l. 15s. The Syrian talent in this valuation consisted of 15 Attic minæ; the Ptolemaic of 20; the Antiochian of 60; the Euboic of 60; the Babylonic of 70; the Greater Attic of 80; the Tyrian of 80; the Eginean of 100; the Rhodian of 100; and the Egyptian of 80 minæ.

There is another talent much more ancient, which Dr Arbuthnot calls the *Homeric talent* of gold, which seems to have weighed six Attic drachms or three darics, a daric weighing very little more than a guinea. According to this talent, some reckon the treasure of King David, particularly that mentioned 1 Chron. xxii. 14. which, according to the common reckoning, would amount in gold talents to the value of 547,500,000l. and the silver to above 342,000,000l.; or, reckoning according to the decuple proportion of gold to silver, the two sums would be equal. As David reigned in Judæa after the siege of Troy, it is not improbable but Homer and he might use the same numeral talent of gold.

Among the Romans there were two kinds of talents, the *little* and the *great* talent: the little was the common talent; and whenever they say simply *talentum*, they are to be understood of this. The little talent was 60 minæ or Roman pounds; the mina or pound estimated at 100 drachmæ or denarii: it was also estimated at 24 great sesterces, which amounted to 60 pounds.

The great talent exceeded the less by one-third part.

Budæus.

Budæus computes, that the little talent of silver was worth 75l. sterling, and the greater 99l. 6s. 8d. sterling. The greater of gold was worth 1125l. sterling.

TALENT, as a species or money, among the Hebrews, was sometimes used for a gold coin, the same with the shekel of gold, called also *stater*, and weighing only four drachms. The Hebrews reckoned by these talents as we do by pounds, &c. Thus a million of gold, or million of talents of gold, among them, was a million of shekels or nummi; the nummus of gold being the same weight with the shekel, viz. four drachms.

But the Hebrew talent weight of silver, which they called *cicar*, was equivalent to that of 3000 shekels, or 113 lb. 10 oz. 1 dwt. $10\frac{2}{7}$ gr. English Troy weight, according to Arbuthnot's computation.

TALIACOTIUS, GASPAR, chief surgeon to the great duke of Tuscany, was born at Bononia in Italy in 1553. He wrote a Latin treatise intitled *Chirurgia Nota de Curtis Membris*, in which he teaches the art of engrafting noses, ears, lips, &c. giving representations of the instruments and proper bandages; many, however, are of opinion that he never put his art in practice. But his doctrine is not singular; for Alexander Benedictus, a famous chirurgical writer, has described a similar operation.

TALLIO (*lex talionis*), a species of punishment in the Mosaic law, whereby an evil is returned similar to that committed against us by another; hence that expression, "Eye for eye, tooth for tooth." This law was at first inserted in the 12 tables amongst the Romans; but afterwards set aside, and a power given to the prætor to fix upon a sum of money for the damage done.

TALISMANS, magical figures cut or engraved with superstitious observations on the characterisms and configurations of the heavens, to which some astrologers have attributed wonderful virtues, particularly that of calling down celestial influences. The talismans of Samothrace, so famous of old, were pieces of iron formed into certain images, and set in rings; these were esteemed preservatives against all kinds of evils. There were likewise talismans taken from vegetables, and others from minerals.

TALLAGE (*tallagium*), from the French *taillé*, is metaphorically used for a part or share of a man's substance carved out of the whole, paid by way of tribute, toll, or tax.

TALLOW, in *Commerce*, the fat of certain animals melted and clarified. It is procured from most animals, but chiefly from bullocks, sheep, hogs, and bears. Some kinds of tallow are used as unguents in medicine, some for making soap and dressing leather, and some for making candles. See FAT, CHEMISTRY *Index*.

TALLOW Tree. See CROTON, BOTANY *Index*.

TALLY, is a stick cut in two parts, on each whereof is marked, with notches or otherwise, what is due between debtor and creditor, as now used by brewers, &c. And this was the ancient way of keeping all accounts, one part being kept by the creditor, the other by the debtor, &c. Hence the tallier of the exchequer, whom we now call the *teller*. But there are two kinds of tallies mentioned in our statutes to have been long used in the exchequer. The one is termed *tallies of debt*, which are in the nature of an acquittance for debts paid to the king, on the payment whereof these tallies are delivered to the debtors, who carrying them to the clerk of the pipe-office, have there an acquittance in parchment for their full discharge. The other are *tallies of reward* or allowance, being made to sheriffs of counties as a recompence for such matters as they have performed to their charge, or such money as is cast upon them in their accounts of course, but not leviable, &c. In the exchequer there is a tally-court, where attend the two deputy-chamberlains of the exchequer and the tally-cutter: and a tally is generally the king's acquittance for money paid or lent, and has written on it words proper to express on what occasion the money is received.

TALLY-Man, a person that sells or lets goods, clothes, &c. to be paid by so much a-week.

TALMUD, a collection of Jewish traditions. There are two works which bear this name, the Talmud of Jerusalem, and the Talmud of Babylon. Each of these is composed of two parts; the Mishna, which is the text, and is common to both, and the Gemara or commentary. See MISHNA and GEMARA.

The Mishna, which comprehends all the laws, institutions, and rules of life which, beside the ancient Hebrew scripture, the Jews thought themselves bound to observe, was composed, according to the unanimous testimony of the Jews, about the close of the second century. It was the work of Rabbi Jehuda (or Juda) Hakkadosh, who was the ornament of the school at Tiberias, and is said to have occupied him forty years. The commentaries and additions which succeeding Rabbis made were collected by Rabbi Jochanan Ben Eliezer, some say in the 5th, others say in the 6th, and others in the 7th century, under the name of *Gemara*, that is, *completion*; because it completed the Talmud. A similar addition was made to the Mishna by the Babylonish doctors in the beginning of the 6th century according to Enfield, and in the 7th according to others.

The Mishna is divided into six parts, of which every one which is intitled *order* is formed of treatises, every treatise is divided into chapters, and every chapter into mishnas or aphorisms. In the *first* part is discussed whatever relates to seeds, fruits, and trees: in the *second* feasts: in the *third* women, their duties, their disorders, marriages, divorces, contracts, and nuptials: in the *fourth* are treated the damages or losses sustained by beasts or men, of things found, deposits, usuries, rents, farms, partnerships in commerce, inheritance, sales and purchases, oaths, witnesses, arrests, idolatry; and here are named those by whom the oral law was received and preserved: in the *fifth* part are noticed what regards sacrifices and holy things: and the *sixth* treats on purifications, vessels, furniture, clothes, houses, leprosy, baths, and numerous other articles. All this forms the Mishna.

As the learned reader may wish to obtain some notion of rabbinical composition and judgement, we shall gratify his curiosity sufficiently by the following specimen: "Adam's *body* was made of the earth of Babylon, his *head* of the land of Israel, his other *members* of other parts of the world. R. Meir thought he was compact of the earth gathered out of the whole earth; as it is written, *thine eyes did see my substance*. Now it is elsewhere written, *the eyes of the Lord are over all the earth*. R. Aha expressly marks the twelve hours in which his various parts were formed. His stature was from one end of the world to the other; and it was for his transgression that the Creator, laying his hand in anger on him, les-

ſened him; for before (ſays R. Eleazar), 'with his hand he reached the firmament.' R. Jehuda thinks his ſin was hereſy; but R. Iſaac thinks that 'it was nouriſhing his foreſkin."

The Talmud of Babylon is moſt valued by the Jews; and this is the book which they mean to expreſs when they talk of the Talmud in general. An abridgement of it was made by Maimonides in the 12th century, in which he rejected ſome of its greateſt abſurdities. The Gemara is ſtuffed with dreams and chimeras, with many ignorant and impertinent queſtions, and the ſtyle very coarſe. The Miſhna is written in a ſtyle comparatively pure, and may be very uſeful in explaining paſſages of the New Teſtament where the phraſeology is ſimilar. This is indeed the only uſe to which Chriſtians can apply it; but this renders it valuable. Lightfoot had judiciouſly availed himſelf of ſuch information as he could derive from it. Some of the popes, with a barbarous zeal, and a timidity of ſpirit for the ſucceſs of the Chriſtian religion, which the belief of its divinity can never excuſe, ordered great numbers of the Talmud to be burned. Gregory IX. burned about 20 cart-loads, and Paul IV. ordered 12,000 copies of the Talmud to be deſtroyed.

The laſt edition of the Talmud of Babylon, printed at Amſterdam, is in 12 vols folio. The Talmud of Jeruſalem is in one large folio.

TALPA, the MOLE; a genus of quadrupeds belonging to the order of *feræ*. See MAMMALIA *Index*.

TAMANDAU. See MYRMECOPHAGA, MAMMALIA *Index*.

TAMARINDUS, the TAMARIND-TREE; a genus of plants; according to Linnæus belonging to the claſs of triandria; but Woodville, Schreber, and other botaniſts, have arranged it under the claſs of monodelphia. See BOTANY *Index*.

TAMARIX, the TAMARISC, a genus of plants belonging to the claſs pentandria; and in the natural ſyſtem ranging under the 13th order, *Succulentæ*. See BOTANY *Index*.

TAMBOUR, in *Architecture*, a term applied to the Corinthian and Compoſite capitals, as bearing ſome reſemblance to a drum, which the French call *tambour*. Some chooſe to call it the *vaſe*, and others *campana* or the bell.

TAMBOUR is alſo uſed for a little box of timber work, covered with a ceiling, withinſide the porch of certain churches; both to prevent the view of perſons paſſing by, and to keep off the wind, &c. by means of folding-doors, &c.

TAMBOUR, alſo denotes a round courſe of ſtone, ſeveral whereof form the ſhaft of a column, not ſo high as a diameter.

TAMBOUR, in the arts, is a ſpecies of embroidery. The tambour is an inſtrument of a ſpherical form, upon which is ſtretched, by means of a ſtring and buckle, or other ſuitable appendage, a piece of linen or thin ſilken ſtuff; which is wrought with a needle of a particular form, and by means of ſilken or gold and ſilver threads, into leaves, flowers, or other figures.

TAMBOURIN, is the name of a dance performed on the French ſtage. The air is lively, and the movements are quick.

The ſame name is applied to a muſical inſtrument, formed of a hoop, over which is ſtretched a piece of parchment or vellum, while bells and hollow hemiſpheres of braſs are looſely hung in holes cut in the hoop. The tambourin is uſed only as an accompaniment to other inſtruments.

TAMERLANE, or TIMUR BEK, a celebrated prince and conqueror. At the age of 25 he attained the higheſt dignities, with ſurpriſing courage, and an ambition aſtoniſhing to all the world. Endeavouring to perfect the great talents which he had received from nature, he ſpent nine years in different countries; where his great ſenſe and elevated genius appeared in councils and aſſemblies, while his intrepidity and valour, whether in perſonal combats or pitched battles, drew upon him the admiration of all mankind. He made himſelf maſter of the three empires of Jagatay Khân, Tuſhi Khân, and Hûlâkû Khân; ſo that his power, riches, and magnificence, were immenſe. There remain vaſt monuments of his grandeur in the cities, towns, caſtles, and walls, which he built: in the rivers and canals which he dug, as well as the bridges, gardens, palaces, hoſpitals, moſques, and monaſteries, which he erected in divers parts of Aſia in ſo great a number, that a king might be accounted very powerful and magnificent, who ſhould have employed 36 years only in building the great edifices which Timûr, cauſed to be founded.

Timûr, according to the hiſtorian Arabſhâh, was in his perſon very corpulent and tall. He had a large forehead and big head. His countenance was agreeable, and his complexion fair. He wore a large beard, was very ſtrong, and well limbed; had broad ſhoulders, thick fingers, and long legs. His conſtitution was amazingly vigorous; but he was maimed in one hand and lame of the right ſide. His eyes appeared full of fire; his voice was loud and piercing; he feared nothing; and when far advanced in years, his underſtanding was ſound and perfect, his body vigorous and robuſt, his mind conſtant and unſhaken like a rock.

He did not like raillery, and could not bear a lie. There was no joking or fooling before him; for he loved the naked truth, even although it was to his own diſadvantage. He neither grieved if he miſcarried in any attempt, nor appeared overjoyed on any great ſucceſs. The device of his ſeal was, "I am ſincere and plain." He had a clear and ſolid underſtanding, was ſurpriſingly happy in his conjectures; vigilant, active, and unſhaken in his reſolutions. He took great delight in reading hiſtory, and was well verſed in the ſtate of countries, provinces, and cities. He was penetrating, ſubtle, cloſe, and diſſembling; juſt by inclination, liberal from diſpoſition; but ambition had in a great meaſure extinguiſhed his humanity; war had familiarized him to blood; and his religious zeal had inſpired him with the moſt cruel, implacable, and pernicious fanaticiſm.

He died on the 1ſt of April 1405, in the 71ſt year of his age and 36th of his reign. When he found death approaching, he ſent for his principal officers, declared his grandſon his heir, and made them ſwear to execute his will. Having recommended brotherly love and concord to the princes his children, he ordered one of the doctors to read the Koran at his bed's head, and often repeat the unity of God. At night he ſeveral times made profeſſion of his belief, "That there is no other God than God," and then expired. See MOGULS, N° 15, &c.

TAMTAM, a flat drum uſed by the Hindoos, reſembling a tabor, but it is larger, and ſounds louder.

TAMUS, BLACK BRIONY, a genus of plants belonging

ing to the claſs diœcia; and in the natural ſyſtem ranking under the 11th order, *Sarmentaceæ*. See BOTANY *Index*.

TAN, the bark of the oak after it has been ground and uſed by the tanner. The ſmalleſt ſort is generally made up in little ſquare cakes called *turf*, and ſold for firing. The coarſer ſort is ſometimes dried in the ſun, and uſed by bakers for heating their ovens, &c. but its chief uſe is for making hot-beds to raiſe pine-apples and other plants.—William III. introduced the uſe of it from Holland, for the purpoſe of raiſing orange trees; after which it was diſcontinued for many years: but about 1719, when *ananas* were firſt brought into England, it came into general uſe, and has ever ſince been in great eſtimation with gardeners for all the purpoſes of forcing, &c. on account of its ſtrong and laſting fermentation. The ſmaller the tan the quicker it heats; but the larger ſort acquires heat more gradually and retains it longer: the ſkilful gardener therefore uſes the one or the other, or a mixture of both, according to the time and purpoſe for which it is wanted. It is ſome time after the tan comes out of the tanner's pit before it begins to heat, and therefore it is not fit for immediate uſe; but having lain a week or two, it enters into a ſtate of fermentation, and if put into hot-beds properly prepared, will retain a moderate heat for three or four months. When it becomes uſeleſs for the hot-houſe, it is ſaid by Miller and others to be an excellent manure for ſome kinds of land.

The word *tan* is ſometimes, though improperly, uſed for the *bark* itſelf, which is the chief ingredient in the tanning of leather. Oak bark, on account of its great aſtringency and gummy-reſinous properties, is preferred to all other ſubſtances for the purpoſe of tanning, as it not only preſerves the leather from rotting, but alſo, by condenſing the pores, renders it impervious to water. See TANNING.

For an account of tan or *tannin*, conſidered as a chemical principle, ſee CHEMISTRY, N° 2504.

TANACETUM, TANSY, a genus of plants belonging to the claſs ſyngeneſia; and in the natural ſyſtem ranging under the 49th order, *Compoſitæ*. See BOTANY *Index*.

TANÆCIUM, a genus of plants belonging to the didynamia claſs; and in the natural method ranking under the 25th order, *Putamineæ*. See BOTANY *Index*.

TANAGRA, TANAGER, a genus of birds belonging to the order of *paſſeres*. See ORNITHOLOGY *Index*.

TANAIS, or DON. See DON.

TANGENT *of an* ARCH, is a right line drawn perpendicularly from the end of a diameter, paſſing to one extremity of the arch, and terminated by a right line drawn from the centre through the other end of that arch, and called the *ſecant*. See GEOMETRY.

TANGIER, a port-town of Africa, in the empire of Morocco and kingdom of Fez, ſituated at the entrance of the ſtraits of Gibraltar, in W. Long. 5. 50. N. Lat. 38. 49. In 1662, this place belonged to the Portugueſe, and was given to King Charles II. upon his marriage with the Infanta of Portugal; but, he growing weary of the charge of keeping it, cauſed it to be blown up and deſtroyed in 1684; ever ſince which time it has been only a poor fiſhing town. Anciently it was called *Tingis*, and gave name to the province of Mauritania Tingitana.

TANK, in the language of Indoſtan, a place incloſed for receiving and retaining rain-water. During the periodical rains the tanks are filled, and thus in the dry ſeaſon furniſh water for the rice fields and cattle. Some of them are of great extent, meaſuring 300 or 400 feet on the ſide; they are of a quadrangular form, and lined with granite, deſcending in regular ſteps from the margin to the bottom.

TANNER, one who dreſſes hides by tanning them. See TANNING.

TANNER, *Dr Thomas*, an Engliſh prelate and celebrated antiquarian, born in 1674. He was admitted of Queen's college Oxford, where a ſimilarity of taſte for antiquities produced a cloſe friendſhip between him and Edmund Gibſon afterwards biſhop of London. In 1697, he was choſen fellow of his college; and having already publiſhed ſome ſpecimens of his antiquarian reſearches; ſoon after became known to Dr Moore biſhop of Norwich, who made him chancellor of his dioceſe. In 1722, he was made archdeacon of Norwich, and in 1731 biſhop of St Aſaph. He died at Oxford in 1735; and after his death was publiſhed an elaborate work, in which he is ſaid to have been employed for 40 years, under this title, *Bibliotheca Britannica Hibernica, ſive de Scriptoribus qui in Anglia, Scotia, et Hibernia, ad ſæculi* XVII. *initium floruerunt*, &c.

TANNING, the art of converting hides and ſkins into leather. This art has been practiſed for many centuries in Britain; but ſome improvements have been made on it, eſpecially in France, ſuggeſted by the diſcoveries of modern chemiſtry. Theſe improvements we ſhall briefly notice after having deſcribed the method lately practiſed in the neighbourhood of London, where the beſt Britiſh leather is manufactured. The general principles on which the improvements are founded, will naturally come to be conſidered, after deſcribing the proceſſes themſelves.

1 Different kinds of leather.

The leather tanned in England is generally divided by the manufacturers into three kinds, *butts* or *backs*, *hides*, and *ſkins*. *Butts*, are made from the ſtouteſt and heavieſt ox hides, and are uſed chiefly for the ſoles of ſtout ſhoes and boots. *Hides*, or *crop-hides*, are made from cow hides, or the lighter ox hides, and are employed for ordinary ſoles. The term *ſkins* is applied to all the other kinds of leather, comprehending that made from the ſkins of calves, ſeals, dogs, kids, &c.

2 Method of tanning butts.

Butts are tanned as follows. After the horns are taken off, the hides are laid ſmooth in heaps for two days in ſummer, and five or ſix in winter; they are then hung on poles in a cloſe room, called a ſmoke-houſe, in which is kept a ſmouldering fire of wet tan; this occaſions a ſmall degree of putrefaction, by which means the hair more eaſily comes off, by ſpreading the hide on a ſort of wooden horſe or beam, and ſcraping it with a crooked knife. The hair being taken off, the hide is thrown into a pool of water, to cleanſe it from the dirt, &c. which being done, it is again ſpread on the wooden beam, and the greaſe, looſe fleſh, extraneous filth, &c. carefully taken off: the hides are then put into a pit of ſtrong liquor, called *ooze*, prepared in pits kept for the purpoſe, by infuſing ground oak bark in water, which is termed *colouring*. The hides are then removed into another pit, called a *ſcouring*, which conſiſts of water ſtrongly impregnated with vitriolic or ſulphuric acid, or a vegetable acid prepared from rye or barley. This operation

Tanning.

operation is called *raiſing*. The hides are then taken out of the ſcouring, and ſpread ſmooth in a pit uſually filled with water, called a *binder*, with a quantity of ground bark ſtrewed between each. After lying a month or ſix weeks, they are taken up, and the decayed bark and liquor being drawn out of the pit, it is again filled with ſtrong ooze, when they are put in as before, with bark between each hide. They now lie two or three months, at the expiration of which the ſame operation is repeated; they then remain four or five months, when they again undergo the ſame proceſs, and after being three months in the laſt pit, are completely tanned, unleſs the hides are ſo remarkably ſtout as to require an additional pit or layer. The whole proceſs requires from 11 to 18 months, and ſometimes two years, according to the ſubſtance of the hide, and diſcretion of the tanner. When taken out of the pit to be dried, they are hung on poles; and after being compreſſed by a ſteel pin, and beaten out ſmooth by wooden beetles, the operation is completed.

3 Of tanning hides.

Hides are thus managed. After the horns are taken off, and the hide is waſhed, they are put into a pit of water, ſaturated with lime, and having mixed with it a quantity of the ſame ſubſtance, where they remain a few days, when they are taken out, and the hair ſcraped off on a wooden beam, as before deſcribed; they are then waſhed in a pit or pool of water, and the looſe fleſh, &c. being taken off, they are removed into a pit of weak ooze, where they are taken up and put down two or three times a day, for the firſt week; every ſecond or third day they are ſhifted into a pit of freſh ooze, ſomewhat ſtronger than the former, till at the end of a month or ſix weeks they are put into a ſtrong ooze, in which they are handled once or twice a week with freſh bark for two or three months. They are then removed into another pit, called a *layer*, in which they are laid ſmooth, with bark ground very fine, ſtrewed above each hide. After remaining here two or three months, they are generally taken up, when the ooze is withdrawn, and the hides put in again with freſh ooze and freſh bark, where, after lying two or three months more, they are completely tanned; except a very few ſtout hides which may require an extra layer. They are then taken out, and hung on poles, and being ſmoothed by a ſteel pin, are, when dry, ready for ſale.

4 Of tanning ſkins.

Skins are to be waſhed in water, &c. and put into lime pits as before mentioned, where they are taken up and put down every third or fourth day for two or three weeks, in order to deſtroy the ſcarf-ſkin. The hair is then ſcraped off, and the excreſcences being removed, they are put into a pit of water impregnated with pigeons dung, called a *grainer*, which in a week or 10 days ſoaking out the lime, greaſe, and ſaponaceous matter, ſoftens the ſkins, and prepares them for the reception of the ooze. They are then put into a pit of weak ooze, in the ſame manner as the hides, and being frequently handled, are by degrees removed into a ſtronger, and ſtill ſtronger liquor, for a month or ſix weeks, when they are put into a very ſtrong ooze, with freſh bark ground very fine, and at the end of two or three months, according to their ſubſtances, are ſufficiently tanned; when they are taken out, hung on poles, and dried.

The lighter ſorts of hides, called *dreſſing hides*, as well as horſe hides, are managed nearly in the ſame manner as ſkins, and are uſed for coach work, harneſs work, &c.

4 Objections to the old methods.

The principal objections to this old method of tanning are, that it is extremely tedious, and very expenſive. Various means have been ſuggeſted for introducing a cheaper and more expeditious method of tanning.

5 Dr Macbride's improvement.

Among the earlieſt of theſe we may notice that of Dr Macbride. This method conſiſts chiefly in the uſe of ſulphuric inſtead of acetous acid, for raiſing or diſtending the pores of the leather, and in ſubſtituting lime water, or a ſolution of lime, for what has been called the *milk* of lime, or a conſiderable quantity of lime diffuſed in water. According to a report made to the committee of commerce of the Dublin ſociety, it appeared that Dr Macbride's method produced a ſaving of more than 20 per cent. to the manufacturer, while the hides were completely tanned in a much ſhorter time. It does not appear, however, that this method ever came into general uſe.

The experiments of M. Seguin, made in the end of the 18th century, on the nature of the tanning principle, led him to ſuggeſt a method of tanning which is certainly much more expeditious than the old method. It has been adopted in England by Mr William Deſmond, and by his directions has been practiſed with conſiderable ſucceſs, by ſome of the principal tanners in Warwickſhire, Staffordſhire, and ſome of the neighbouring counties. The following directions, communicated by Mr Deſmond to the editor of the Philoſophical Magazine, will ſufficiently explain this new proceſs.

6 Mr Deſmond's method.

Provide five veſſels, called *digeſters*, of any convenient materials and dimenſions, with an aperture at the bottom of each. Let them be placed near each other, and elevated on ſtillages or otherwiſe; ſo that a ſmall veſſel may be placed under them. Fill the digeſters with tan, viz. the bark of certain trees, ſuch as of oak, cut ſmall, or ground to a coarſe powder. Pour water on the tan in the firſt digeſter, where it may ſtand ſome time, or be immediately drawn off. This liquor is to be poured on the tan in the ſecond digeſter; from that to the third, and ſo on, until it comes through the tan in the laſt digeſter. The liquor is then highly coloured, and marks from 6° to 8° on the hydrometer for ſalts. This liquor is to be uſed for tanning the thickeſt hides, and may be called the *tanning lixivium*. If you take a ſmall quantity of it in a glaſs, and pour on it a few drops of a ſolution of animal glue, the clear liquor becomes turbid, and a whitiſh ſubſtance falls to the bottom. The precipitate thus obtained, is a ſure indication that the liquor contains the tanning principle; for this reaſon, that glue being of the ſame nature with the ſkins or hides of which it is made, whatever ſubſtance unites itſelf indiſſolubly with the former, will do ſo likewiſe with the latter.

This ſolution is made by diſſolving a little common glue in water over a moderate fire; by means of it, not only oak bark, but alſo the bark of ſeveral other trees, as well as different ſhrubs, and plants, all which may be called *tan*, are found to contain the tanning principle; and by employing the ſolution as before, it will be always eaſy to aſcertain whether any given ſubſtance contains this principle.

In the courſe of theſe lixiviations it may be obſerved, 1. That the liquor running from the firſt digeſter, at length

Tanning. length loſes its colour. If in this ſtate a little of it be put into a glaſs, and the former experiment be repeated, the liquor no longer becomes turbid, but remains clear, which ſhews that it contains no more of the tanning principle; but if a few drops of a ſolution of ſulphate of iron be poured into the ſame glaſs, the liquor becomes thick and black, which is not to be poured on the tan in the ſecond digeſter, but afterwards uſed for taking off the hair or wool. It is known by the name of *gallic lixivium*, as it appears to contain the ſame principles with galls.

The liquid ſulphate of iron is obtained by diſſolving a ſmall quantity of iron in diluted ſulphuric acid, or by diſſolving green copperas in water. This ſolution ſerves to aſcertain ſuch ſubſtances as contain the gallic principle. Lime water will alſo produce this effect.

When the liquor ceaſes to grow black by the mixture of the ſulphate of iron, it will be in vain to pour any more water on the tan in the firſt digeſter. This tan being thus exhauſted, muſt be removed, and new tan put in its place.

The liquor, after running through all the digeſters, at laſt grows weak. All the liquor that marks from 6° to 8° on the hydrometer, muſt be added to the ſtock of tanning lixivium. What proceeds afterwards from the laſt digeſter is to be poured on the new tan in the firſt. Then the freſh water is to be conveyed on the tan in the ſecond digeſter, and the liquor of the firſt ſet aſide, while it marks 6° or 8° on the hydrometer, and added to the tanning lixivium, which muſt always be carefully ſeparated from the gallic. In this manner, the tan in all the digeſters may be renewed, and the lixiviations continued.

The number of theſe lixiviations, as well as the mode of making them, may be varied at pleaſure; the eſſential point is to repeat them ſo as to give the liquor a ſufficient degree of concentration, which may be determined by the hydrometer, and proportioned to the quickneſs required in the operation, and the thickneſs of the hides and ſkins to be tanned; all which experience will ſoon teach. As all kinds of tan are not equally good, it will ſometimes happen that ſix or more filtrations will be neceſſary to obtain a lixivium of 6° or 8°, in which caſe the number of digeſters muſt be increaſed, and the ſame method purſued as above; and when a weaker lixivium is wanted, three or four filtrations will be ſufficient.

The perſon directing theſe lixiviations ſhould be provided with the ſolution of glue and ſulphate of iron, already deſcribed, in order to aſcertain the qualities of the different lixivia, as well as with a hydrometer properly graduated, to determine their degree of concentration or ſpecific gravity.

In tanning cow and ox hides with this lixivium, they ſhould firſt be waſhed in running water, well cleaned, and fleſhed in the uſual way. For removing the hair, the hides are to be ſteeped for two or three days in a vat filled with the gallic lixivium, and a mixture of ſulphuric acid, marking 66° on the hydrometer for acids, and in the proportion of one to a thouſand, or one pint to 125 gallons. During this ſteeping, the hair is ſeparated from the hides in ſuch a manner, that it may be eaſily known when they are to be taken out of the vat, that is, when the hair is quite looſe. It is to be ſcraped off with a round knife on the horſe or beam.

When raiſing is neceſſary, the hides are immerſed for 10 or 12 hours in a vat filled with water, and $\frac{1}{300}$ of its volume of mineral acid, of the ſame quality with the former, and the operation of raiſing is finiſhed. The hides are repeatedly waſhed, and the round knife is uſed, after which they are prepared for tanning. Tanning.

The reſt of the proceſs conſiſts in tanning, properly ſo called; for which purpoſe, the hides are to be ſteeped ſome hours in a weak lixivium of only 1° or 2°; to obtain which, that is to be taken which runs from the ſecond digeſter, or ſome already uſed for tanning. They are next put into a ſtronger lixivium, where in a few days they will be brought to the ſame degree of ſaturation with the liquor in which they are immerſed. The ſtrength of the liquor being then much diminiſhed, it muſt be renewed; and when the hides are completely ſaturated, or fully tanned, which is known by cutting off a bit of the edge, remove the leather, and let it dry ſlowly in a ſhady place.

For calf ſkins, goat ſkins, &c. theſe are firſt fleſhed with the knife, and worked in running water like the others. They are then ſteeped in lime water, in which there ſhould be more lime than the water can diſſolve at once. What is not diſſolved will ſubſide, but muſt be mixed with the water, by ſtirring it ſeveral times a-day. In two or three days the ſkins are to be removed; when the hair is found quite looſe, it is ſcraped off on the horſe. They are then waſhed and preſſed well, till the water running from them is perfectly clear, and the lime totally extracted. They are firſt ſteeped in a weak lixivium, then tanned as above; but the tanning lixivium muſt not be nearly ſo ſtrong as that for hides.

Lime is uſed for theſe ſoft ſkins inſtead of a mixture of gallic lixivium and ſulphuric acid, becauſe the acid always ſwells the leather more or leſs, and becauſe the lime may be more eaſily extracted from them, by waſhing and compreſſing them, than from the thick hides, which, when limed, are harſh and apt to crack, if the lime be not wholly extracted before they are tanned.

Among the different methods of immerſion which may be practiſed in the courſe of theſe operations, the beſt way ſeems to be that of ſuſpending the hides and ſkins vertically in the lixivia, by means of tranſverſe rods or bars, and at ſuch a diſtance aſunder as not to touch each other in any one point. If they are laid out the one over the other, they will require frequent *handling*, in order that all the parts may be equally ſaturated, and to prevent the folds or plaits that would otherwiſe be formed in them. In ſome caſes it will be found expedient to mix freſh tan from time to time with the lixivium, which will depend on the ſtate and quality of the hides and ſkins to be tanned, as well as on the purpoſes for which they are intended. All theſe conſiderations muſt be left to the judgement of the manufacturer; but they do not change the principle on which this mode of tanning is founded.

Mr Deſmond aſſerts, that beſides the very great ſavings in point of time and labour, the leather tanned according to the above method being more completely ſaturated, will be found to weigh heavier, to wear better, and to be leſs ſuſceptible of moiſture, than the leather tanned in the uſual way *. * *Philoſ. Mag.* xi. 20.

7 Principles of tanning.

In explaining the principles on which the ſeveral parts of the tanning proceſs depend, we muſt firſt remark, that the principal object of tanning is, to combine

Tanning.

bine the gelatinous part of the hides with the tanning principle of aſtringent vegetables as intimately as poſſible, and thus produce that compound which we call leather, and which is inſoluble in water. The chief part of the proceſs therefore conſiſts in ſteeping the hides in a ſolution of tannin till they are ſufficiently impregnated with the tanning principle; and to this operation the others are ſubſervient, only as they prepare the hides to be more eaſily acted on by the tanning principle.

The infuſions of oak bark, when chemically examined, are found to contain two principal ſubſtances, one precipitable by ſolution of gelatine made from glue or iſinglaſs, and this gives a denſe black, with ſolution of common ſulphate of iron; the other not precipitable by ſolution of gelatine, but precipitating the ſalts of iron of a browniſh black, and the ſalts of tin of a fawn colour.

The former of theſe is the tanning principle, or the tannin of Seguin; it is eſſential to the converſion of ſkin into leather. The latter is the colouring or extractive matter; it is capable of entering into union with ſkin, and it gives to it a brown colour; but it does not render it inſoluble in boiling water.

It has been generally ſuppoſed that the infuſion of oak bark contains a peculiar acid, called gallic acid; but ſome late experiments render this opinion doubtful; and this principle, if it exiſts in oak bark, is in intimate combination with the extractive or colouring matter.

In the common proceſs of tanning, the ſkin, which is chiefly compoſed of gelatine, ſlowly combines in its organized form with the tannin and extractive matter of the infuſions of bark; the greater proportion of its increaſe of weight, however, is owing to tannin, and from this ſubſtance the leather derives its characteriſtic properties; but its colour, and the degree of its flexibility, appear to be influenced by the quantity of colouring matter that it contains. When ſkin, in large quantity, is ſuffered to exert its full action on a ſmall portion of infuſion of bark, containing tannin and extractive matter, the fluid is found colourleſs. It gives no precipitate to ſolution of gelatine, and produces very little effect on the ſalts of iron or of tin. The tanning principle of oak bark is more ſoluble in water than the extractive matter; and the relative proportion of tannin to extractive matter is much greater in ſtrong infuſions of oak bark than in weak ones; and when ſtrong infuſions are uſed for tanning, a larger proportion of tannin is combined with the matter of ſkin.

The ſtate of the ſkin with regard to its impregnation with tannin may be eaſily aſcertained by cutting it tranſverſely with a ſharp knife, as the tanned part will appear of a nutmeg colour, while the unimpregnated part retains its whiteneſs. Though the impregnation of the ſkins with tannin be an eſſential part of the proceſs, ſomething more is required to give the leather its proper degree of ſtrength and pliability. The infuſions of oak bark, eſpecially the weaker infuſions, contain, beſides tannin, more or leſs of extractive matter, which is abſorbed by the ſkins during the tanning proceſs. Hence it appears, that a ſolution of tannin alone would not convert the ſkins into leather; and that as concentrated infuſions of oak bark contain a leſs proportional quantity of extractive matter, they are not ſo well calculated for the purpoſes of tanning as the weaker infuſions. This is an important concluſion, as it ſhews that the vulgar opinion of tanners reſpecting the propriety of the old methods, and what they call *feeding* the leather, is founded on rational principles. In fact it appears that, though, in the quick method, recommended by Seguin and Deſmond, the leather may be more expeditiouſly, and perhaps more completely impregnated with tannin, it is deficient in ſtrength and pliability, from the want of its due proportion of extractive matter.

Having thus explained the principles on which the material part of the tanning proceſs depends, we muſt briefly notice the *rationale* of the preliminary operations.

Chaptal has ſhewn, that when ſkin is immerſed in a tanning liquor, without having been previouſly freed from its cuticle or ſcarf-ſkin, the impregnation of tannin takes place only on the fleſh ſide. This ſhews the neceſſity, eſpecially in the thicker hides or butts, of removing the cuticle, before ſteeping the hides in the tanning liquor. The ſmall degree of putrefaction to which the butts are ſubjected, has this effect, and the ſteeping of the hides and ſkins in lime water contributes to the ſame end; for though lime does not ſeem to be capable of diſſolving the cuticle, it renders it friable, ſo that it is eaſily removed by the inſtruments employed for ſcraping off the hair. Not only the cuticle, but likewiſe the ſoft matter of the extremity of the hair is acted on by lime; and this effect muſt conſiderably tend to facilitate the proceſs of depilation. The ſame ſubſtance mixing with the fat on the fleſhy ſide of the ſkins, forms a ſoapy compound, which, with other extraneous matter, is removed by the ſubſequent waſhings.

It has been ſuppoſed that the acids in which the ſkins are ſteeped, previous to their immerſion in tanning liquors, have the effect of opening their pores, and thus rendering them more eaſily penetrable by the tanning principle and extractive matter. We believe that this opinion is erroneous, as we cannot ſee how acids, the obvious effect of which ſeems to be that of contracting animal matter, can enlarge the pores of the ſkins. It is probable that they produce ſome other advantageous effect not yet ſufficiently underſtood, in preparing the ſkins for being more perfectly acted on by the tanning liquors.

The principal effect of the grainer, or the pigeons dung employed in the thinner ſkins, ſeems to be that of promoting putrefaction, and rendering the ſkins leſs elaſtic, though the alkali evolved during the fermentation of the dung, may aſſiſt in removing the fat on the fleſh ſide of the ſkins.

Substitutes for oak bark.

As from the preſent great demand, and conſequent ſcarcity of oak timber, oak bark has become a very expenſive article, it may be proper to enumerate a few of the principal vegetable ſubſtances, eſpecially thoſe indigenous to Great Britain, that may be ſubſtituted for it. Of theſe the bark of the Scotch fir appears to be moſt deſerving of attention, and was ſome years ago employed by a gentleman in Ireland with great ſucceſs. Several ſpecies of willow afford a good ſubſtitute for oak bark, particularly the Leiceſter willow, of which the entire bark produces a greater quantity of ſolid extract than the entire bark of oak. Next to theſe may be mentioned the bark of the common elm, the root of tormentil (*tormentilla vulgaris*, Lin.) which has been long employed in the north of Scotland as an article of domeſtic

meſtic tanning. To theſe may be added the herb avens (*geum urbanum*, Lin.), ſeveral ſpecies of cinquefoil, and of biſtort, common ladies mantle (*alchemilla vulgaris*), and the root of the common water-flag (*iris pſeudacorus*, Lin.). Of plants not indigenous to Britain, but generally cultivated here, we may particularly notice the *horſe-cheſnut*, the bark of which is a ſtrong aſtringent, and might be employed, we think, with great advantage in tanning. The moſt powerful tanning ſubſtance, however, with which we are acquainted, is the juice or extract of the *mimoſa catechu*, commonly called *Japan earth*, one pound of which will tan as much leather as ſeven or eight pounds of oak bark.

Our limits will not permit us to extend this article, by deſcribing the proceſſes for tanning employed in other countries. On the method purſued in Ruſſia, our readers may conſult Tooke's *View of the Ruſſian Empire;* and of the French method of tanning, an ample account has been given in a publication by De Lalande. Another on the ſame ſubject may ſoon be expected from Chaptal. The moſt complete work on Britiſh tanning, and on other proceſſes to which leather is ſubjected, with which we are acquainted, is a ſmall volume entitled *The Art of Tanning and Currying Leather*, publiſhed by the Dublin Society in 1780. Several uſeful papers on this ſubject may alſo be found in Nicholſon's *Philoſophical Journal*, and Tilloch's *Philoſophical Magazine*.

For an account of other proceſſes connected with the leather manufacture, ſee LEATHER and CURRYING.

TANTALIUM, a new metal which has been detected in two minerals. See MINERALOGY, p. 250.

TANTALUS, in fabulous hiſtory, king of Phrygia and Paphlagonia, was the ſon of Jupiter and the nymph Plota. He one day entertained the gods at his table; when, to prove their divinity, he ſerved up his ſon Pelops cut in pieces. All the deities, except Ceres, perceived his cruelty and impiety, and would not touch his proviſions. That goddeſs, whoſe thoughts were ſolely employed about her daughter Proſerpine, inadvertently ate a part of his left ſhoulder. Pelops, however, was reſtored to life; and an ivory ſhoulder given him in the room of that which had been eaten; while Tantalus was thrown into Tartarus, where he was puniſhed with perpetual hunger and thirſt. He was chained in a lake; the water of which reached up to his chin, but retired when he attempted to drink. The branch of a tree loaded with fruit hung down even to his lips, but on his attempting to pluck the fruit the branch ſprung upwards.

TANTALUS, a genus of birds belonging to the order of grallæ. See ORNITHOLOGY *Index*.

TANTALUS'S Cup. See *SCIENCE*, *Amuſements of*, N° 33.

TANZY, or TANSY. See TANACETUM, BOTANY *Index*.

TAORMINA, a town in Sicily, which is ſituated on a high rock, and is 88 miles ſouth of Meſſina. Of its origin little is known. A colony from the iſle of Naxos ſettled at the foot of Etna, at no great diſtance from the ſhore, and at about a league or a league and a half from the preſent ſituation of Taormina. Dionyſius the Tyrant attacked this colony, and either took or ſet fire to their city. The inhabitants retired to the rocks of Mount Taurus; among which they found a tract of ground ſufficiently level and ſecure, and of ſufficient extent. Here, therefore, they built a city; which, after the mountain, they named *Tauromenium*. It was at length raiſed to a very flouriſhing ſtate by trade, and became celebrated as a ſeat of the arts, the remains of which ſhow that the fine arts muſt have been once ſucceſsfully cultivated at Tauromenium.

Among other remains are ſtill to be ſeen a ſpacious theatre, a tomb, and a large natural grotto, which appears to have been anciently adorned within with artificial ornaments. After the inhabitants of Taormina embraced Chriſtianity, they ſtill continued to viſit this grotto with devout veneration. Inſtead of the Pagan divinities to whom it had before been ſacred, they ſubſtituted a ſaint, the venerable St Leonard. But St Leonard did not long draw crowds to this grotto; and the Chriſtians have either defaced its Pagan decorations, or ſuffered them to fall into decay by the injuries of time. It is now black and ſmoky; and it is with difficulty that any remains of the Greek paintings with which it was once ornamented can be diſtinguiſhed.

TAPE-WORM. See TÆNIA, HELMINTHOLOGY *Index*.

TAPER, TAPERING, is underſtood of a piece of timber, or the like, when thick at one end, and gradually diminiſhing to the other; as is the caſe in pyramids, cones, &c.

To meaſure TAPER-Timber, &c. See *SLIDING Rule*.

TAPER-Bored, is applied to a piece of ordnance when it is wider at the mouth than towards the breech.

TAPER, alſo denotes a kind of tall wax candle, placed in a candleſtick, and burnt at funeral proceſſions, and in other church ſolemnities.

Tapers are made of different ſizes; in ſome places, as Italy, &c. they are cylindrical; but in moſt other countries, as England, France, &c. they are conical or taper; whence poſſibly the name; unleſs we rather chooſe to derive taper, in the adjective ſenſe from the ſubſtantive taper, in the Saxon *tapen* or *tapon*, *cereus*, "wax-candle." Both kinds are pierced at bottom for a pin in the candleſtick to enter.—There are two ways of making tapers, the firſt with the ladle, the ſecond by hand; for which, ſee CANDLE.

Paſchal TAPER, among the Romaniſts, is a large taper, whereon the deacon applies five bits of frankincenſe, in holes made for the purpoſe in form of a croſs; and which he lights with new fire in the ceremony of Eaſter Saturday.

The Pontifical makes Pope Zoſimus the author of this uſage; but Baronius will have it more ancient, and quotes a hymn of Prudentius to prove it. That pope he ſuppoſes to have only eſtabliſhed the uſe thereof in pariſh-churches, which, till then, had been reſtrained to greater churches.

F. Papebroch explains the original of the paſchal taper more diſtinctly, in his *Conatus Chronico-Hiſtoricus*, &c. It ſeems, though the council of Nice regulated the day whereon Eaſter was to be celebrated, it laid it on the patriarch of Alexandria to make a yearly canon thereof, and to ſend it to the pope. As all the other moveable feaſts were to be regulated by that of Eaſter, a catalogue of them was made every year; and this was written on a taper, *cereus*, which was bleſſed in the church with much ſolemnity.

Taper, Tapestry.

This taper, according to the abbot Chastelain, was not a wax-candle made to be burnt; it had no wick, nor was it any thing more than a kind of column of wax, made on purpose to write the list of moveable feasts on; and which would suffice to hold that list for the space of a year.

For among the ancients, when any thing was to be written to last for ever, they engraved it on marble or steel; when it was to last a long while, they wrote it on Egyptian paper; and when it was only to last a short time, they contented themselves to write it on wax. In process of time they came to write the moveable feasts on paper, but they still fastened it to the paschal taper. Such is the original of the benediction of the paschal taper.

TAPESTRY, a kind of cloth made of wool and silk, adorned with figures of different animals, &c. and formerly used for lining the walls of rooms, churches, &c.

The art of weaving tapestry is supposed to have been borrowed from the Saracens; accordingly the workmen employed in this manufacture in France were formerly called *Sarazins* or *Sarazinois*. Guicciardini ascribes the invention of tapestry hangings to the inhabitants of the Netherlands; but he has not mentioned at what time the discovery was made. This art was brought into England by William Sheldon, near the end of Henry VIII.'s reign. In 1619 a manufacture was established at Mortlake in Surry by Sir Francis Crane, who received 2000l. from King James to encourage the design. The first manufacture of tapestry at Paris was set up under Henry IV. in 1606 or 1607, by several artists whom that monarch invited from Flanders. Under Louis XIV. the manufacture of the Gobelins was instituted, which has introduced very beautiful cloths, remarkable for strength, for elegance of design, and a happy choice of colours. The finest paintings are copied, and eminent painters have been employed in making designs for the work.

Tapestry-work is distinguished by the workmen into two kinds, viz. that of high and that of low warp; though the difference is rather in the manner of working than in the work itself; which is in effect the same in both: only the looms, and consequently the warps, are differently situated; those of the low warp being placed flat and parallel to the horizon, and those of the high warp erected perpendicularly. The English anciently excelled all the world in the tapestry of the high warp; and they still retain their former reputation, though with some little change: their low warps are still admired; but as for the high ones, they are quite laid aside by the French. The French, before the revolution, had three considerable tapestry manufactures besides that of the Gobelins; the first at Aubusson in Auvergne, the second at Felletin in the Upper Marche, and the third at Beauvais. They were all equally established for the high and the low warp; but they had all laid aside the high warp excepting the Gobelins. There were admirable low warps likewise in Flanders, generally exceeding those of France; the chief and almost only Flemish manufactures were at Brussels, Antwerp, Oudenard, Lisle, Tournay, Bruges, and Valenciennes; but of the state of these manufactures now we are ignorant.

The usual widths of tapestry are from two ells to three ells Paris measure. Tapestry.

The Manufacture of Tapestry of the High Warp.—The loom on which it is wrought is placed perpendicularly: it consists of four principal pieces; two long planks or cheeks of wood, and two thick rollers or beams. The planks are set upright, and the beams across them, one at the top and the other at the bottom, or about a foot distance from the ground. They have each their trunnions, by which they are suspended on the planks, and are turned with bars. In each roller is a groove, from one end to the other, capable of containing a long round piece of wood, fastened therein with hooks. The use of it is to tie the ends of the warp to. The warp, which is a kind of worsted, or twisted woollen thread, is wound on the upper roller; and the work, as fast as wove, is wound on the lower. Withinside the planks, which are seven or eight feet high, fourteen or fifteen inches broad, and three or four thick, are holes pierced from top to bottom, in which are put thick pieces of iron, with hooks at one end serving to sustain the coat-stave: these pieces of iron have also holes pierced, by putting a pin in which the stave is drawn nearer or set farther off; and thus the coats or threads are stretched or loosened at pleasure. The coat-stave is about three inches diameter, and runs all the length of the loom; on this are fixed the coats or threads, which make the threads of the warp cross each other. It has much the same effect here as the spring-stave and treddles have in the common looms. The coats are little threads fastened to each thread of the warp with a kind of sliding knot, which forms a sort of mash or ring. They serve to keep the warp open for the passage of broaches wound with silks, woollens, or other matters used in the piece of tapestry. In the last place, there are a number of little sticks of different lengths, but all about an inch in diameter, which the workman keeps by him in baskets, to serve to make the threads of the warp cross each other, by passing them across; and, that the threads thus crossed may retain their proper situation, a packthread is run among the threads above the stick.

The loom being thus formed, and mounted with its warp, the first thing the workman does is to draw on the threads of this warp the principal lines and strokes of the design to be represented on the piece of tapestry; which is done by applying cartoons made from the painting he intends to copy to the side that is to be the wrong side of the piece, and then, with a black lead pencil, following and tracing out the contours thereof on the thread of the right side; so that the strokes appear equally both before and behind.

As for the original design the work is to be finished by, it is hung up behind the workmen, and wound on a long staff, from which a piece is unrolled from time to time as the work proceeds.

Besides the loom, &c. here described, there are three other principal instruments required for working the silk or the wool of the woof within the threads of the warp; these are a broach, a reed, and an iron needle. The broach is made of a hard wood, seven or eight inches long, and two-thirds of an inch thick, ending in a point with a little handle. This serves as a shuttle; the silks, woollens, gold, or silver, to be used in the work

work being wound on it. The reed or comb is alſo of wood, eight or nine inches long, and an inch thick on the back, whence it grows leſs and leſs to the extremity of the teeth, which are more or leſs apart, according to the greater or leſs degree of fineneſs of the intended work. Laſtly, the needle is made in form of the common needle, only bigger and longer. Its uſe is to preſs cloſe the wool and ſilks when there is any line or colour that does not fit well.

All things being prepared for the work, and the workman ready to begin, he places himſelf on the wrong ſide of the piece, with his back towards the deſign: ſo that he works as it were blindfold, ſeeing nothing of what he does, and being obliged to quit his poſt, and go to the other ſide of the loom whenever he would view and examine the piece, to correct it with his preſſing-needle. To put ſilk, &c. in the warp, he firſt turns and looks at the deſign; then, taking a broach full of the proper colour, he places it among the threads of the warp, which he brings croſs each other with his fingers, by means of the coats or threads faſtened to the ſtaff; this he repeats every time he is to change his colour. Having placed the ſilk or wool, he beats it with his reed or comb; and when he has thus wrought in ſeveral rows over each other, he goes to ſee the effects they have, in order to reform the contours with his needle, if there be occaſion. As the work advances, it is rolled upon the lower beam, and they unroll as much warp from the upper beam as ſuffices them to continue the the piece: the like they do of the deſign behind them. When the pieces are wide, ſeveral workmen may be employed at once.

We have but two things to add: the firſt is, that the high warp tapeſtry goes on much more ſlowly than the low warp, and takes up almoſt twice the time and trouble. The ſecond is, that all the difference that the eye can perceive between the two kinds, conſiſts in this, that in the low warp there is a red fillet, about one-twelfth of an inch broad, running on each ſide from top to bottom, which is wanting in the high warp.

Manufacture of Tapeſtry of the Low Warp.—The loom or frame, whereon the low warp is wrought, is much like that of the weavers; the principal parts thereof are two ſtrong pieces of wood forming the ſides of the loom, and bearing a beam or roller at each end: they are ſuſtained at bottom with other ſtrong pieces of wood in manner of treſtes; and, to keep them the firmer, they are likewiſe faſtened to the floor with a kind of buttreſſes, which prevent any ſhaking, though there are ſometimes four or five workmen leaning on the fore-beam at once.

The rollers have each their trunnions, by which they are ſuſtained: they are turned by large iron pins three feet long. Along each beam runs a groove, wherein is placed the wich, a piece of wood of about two inches diameter, and almoſt of the length of the roller: this piece fills the groove entirely, and is faſtened therein, from ſpace to ſpace, by wooden pins. To the two wiches are faſtened the two extremities of the warp, which is wound on the farther roller, and the work, as it advances, on the nearer.

Acroſs the two ſides, almoſt in the middle of the loom, paſſes a wooden bar, which ſuſtains little pieces of wood, not unlike the beam of a balance: to theſe pieces are faſtened ſtrings, which bear certain ſpring ſtaves, wherewith the workman, by means of two treddles under the loom whereon he ſets his feet, gives a motion to the coats, and makes the threads of the warp riſe and fall alternately. Each loom has more or fewer of theſe ſpring-ſtaves, and each ſtaff more or fewer coats, as the tapeſtry conſiſts of more or fewer threads.

The deſign or painting the tapeſtry-man is to follow is placed underneath the warp; where it is ſuſtained from ſpace to ſpace with ſtrings, by means of which the deſign is brought nearer the warp.

The loom being mounted, there are two inſtruments uſed in working it, viz. the reed and the flute. The flute does the office of the weaver's ſhuttle; it is made of an hard poliſhed wood, three or four lines thick at the ends, and ſomewhat more in the middle, and three or four inches long. On it are wound the ſilks or other matters to be uſed as the woof of the tapeſtry. The comb or reed is of wood or ivory; it has uſually teeth on both ſides; it is about an inch thick in the middle, but diminiſhes each way to the extremity of the teeth: it ſerves to beat the threads of the woof cloſe to each other, as faſt as the workman has paſſed and placed them with his flute among the threads of the warp.

The workman is ſeated on a bench before the loom, with his breaſt againſt the beam, only a cuſhion or pillow between them; and, in this poſture, ſeparating, with his fingers, the threads of the warp, that he may ſee the deſign underneath, and taking a flute, mounted with a proper colour, he paſſes it among the threads, after having raiſed or lowered them, by means of the treddles moving the ſpring-ſtaves and coats.

Laſtly, To preſs and cloſe the threads of the ſilk or yarn, &c. thus placed, he ſtrikes each courſe (i. e. what the flute leaves in its paſſing and coming back again) with the reed.

TAPIOCA, a ſpecies of ſtarch, which the Brazileans make from the roots of the caſſada plant. See JATROPHA, BOTANY *Index*.

TAPIR, a quadruped of the order of belluæ, reſembling the hippopotamus. See MAMMALIA *Index*.

TAPPING, in general, the act of piercing a hole in a veſſel, and applying a tube or canula in the aperture, for the commodious drawing off the liquor contained therein.

TAPPING, in *Surgery*. See PARACENTESIS, SURGERY *Index*.

TAPROBANA, the ancient name of the iſland of Ceylon. See CEYLON, and GEOGRAPHY, N° 28.

TAR, a thick, black, unctuous ſubſtance, obtained chiefly from old pines and fir-trees by burning them with a cloſe ſmothering heat. It is prepared in great quantities in Norway, Sweden, Germany, Ruſſia, and North America, and in other countries where the pine and fir abound.

Becher, the celebrated chemiſt, firſt propoſed to make tar from pit-coal. Manufactures for this purpoſe have been eſtabliſhed many years ago in the biſhopric of Liege, and in ſeveral parts of England. In the year 1781, the earl of Dundonald obtained a patent for extracting tar from pit-coal by a new proceſs of diſtillation. Great hopes were entertained of the value of this diſcovery, but we have not heard that it has anſwered expectation.

Tar, which is well known for its economical uſes, is properly an empyreumatic oil of turpentine, and has been much

Taranto || Targum.

much used as a medicine both internally and externally. Tar-water, or water impregnated with the more soluble parts of tar, was formerly a very popular remedy.

TARANTO, the ancient TARENTUM, a sea-port town of Italy, in the kingdom of Naples, and in the Terra de Otranto. It is a strong and populous place, with an archbishop's see, and the title of a principality. It is seated on a peninsula, and is defended by a strong castle; but the harbour is choaked up. E. Long. 17. 29. N. Lat. 40. 35.

TARANTULA, a species of aranea, so called from Taranto, the place where it is said to abound. See ARANEA, ENTOMOLOGY *Index*.

TARASCON, an ancient and populous town of France, in the department of the Mouths of the Rhone, and late province of Provence, with a well-built castle, seated on the river Rhone, opposite Beaucaire, with which it communicates by a bridge of boats. Its commerce consists in oil, brandy, starch, and stuffs that are much worn, one sort being of coarse silk, and the other of the same material and wool. It is 10 miles north of Arles, and 375 south by east of Paris. E. Long. 4. 45. N. Lat. 43. 46.

TARAZONA, a strong town of Spain, in the kingdom of Arragon, and on the frontiers of Old Castile, with a bishop's see. It is seated partly on a rock, and partly in a fertile plain, on the river Chiles. It was taken from the Moors in 1110. W. Long. 1. 26. N. Lat. 42. 10.

TARCHONANTHUS, FLEA-BANE, a genus of plants belonging to the class syngenesia; and in the natural system ranging under the 49th order, *Compositæ*. See BOTANY *Index*.

TARE, is an allowance for the outside package that contains such goods as cannot be unpacked without detriment; or for the papers, threads, bands, &c. that inclose or bind any goods imported loose; or though imported in casks; chests, &c. yet cannot be unpacked and weighed neat.

TARE, or VETCH. See VICIA, BOTANY *Index*.

TARGET, a kind of shield or weapon of defence made use of by the ancients.

TARGIONIA, a genus of plants belonging to the class of cryptogamia, and natural order of *Algæ*. See BOTANY *Index*.

TARGUM, a name given to the Chaldee paraphrases of the books of the Old Testament. They are called *paraphrases* or *expositions*, because they are rather comments and explications than literal translations of the text. They are written in the Chaldee tongue, which became familiar to the Jews after the time of their captivity in Babylon, and was more known to them than the Hebrew itself. So that when the Hebrew text was read in the synagogue, or in the temple, they generally added to it an explication in the Chaldee tongue for the service of the people, who had but a very imperfect knowledge of the Hebrew tongue. It is probable, that even from the time of Ezra this custom began, since this learned scribe, reading the law to the people in the temple, explained it, with the other priests that were with him, to make it understood by the people (Nehem. viii. 7—9.).

But though the custom of making these sorts of expositions in the Chaldee language be very ancient among the Hebrews, yet have they no written paraphrases or targums before the era of Onkelos and Jonathan, who lived about the time of our Saviour. Jonathan is placed about 30 years before Christ, under the reign of Herod the Great. Onkelos is something more modern. The Targum of Onkelos is the most of all esteemed, and and copies are to be found in which it is inserted verse for verse with the Hebrew. It is so short and so simple, that it cannot be suspected of being corrupted. This paraphrast wrote only upon the books of Moses; and his style approaches nearly to the purity of the Chaldee, as it is found in Daniel and Ezra. This targum is quoted in the Misna, but was not known either to Eusebius, St Jerome, or Origen.

The Targum of Jonathan son of Uziel is upon the greater and lesser prophets. He is much more diffuse than Onkelos, and especially upon the lesser prophets, where he takes great liberties, and runs on in allegories. His style is pure enough, and approaches pretty near to the Chaldee of Onkelos. It is thought that the Jewish doctors who lived above 700 years after him made some additions to him.

The Targum of Joseph the Blind is upon the Hagiographa. This author is much more modern, and less esteemed than those we have now mentioned. He has written upon the Psalms, Job, the Proverbs, the Canticles, Ecclesiastes, Ruth, and Esther. His style is a very corrupt Chaldee, with a great mixture of words from foreign languages.

The Targum of Jerusalem is only upon the Pentateuch; nor is that entire or perfect. There are whole verses wanting, others transposed, others mutilated; which has made many of opinion that this only is a fragment of some ancient paraphrase that is now lost. There is no targum upon Daniel, or upon the books of Ezra and Nehemiah.

These targums are of great use for the better understanding not only of the Old Testament, on which they are written, but also of the New. As to the Old Testament, they serve to vindicate the genuineness of the present Hebrew text, by proving it to be the same that was in use when these targums were made, contrary to the opinion of those who think the Jews corrupted it after our Saviour's time. They help to explain many words and phrases in the Hebrew original, and they hand down to us many of the ancient customs of the Jews. And some of them, with the phraseologies, idioms, and peculiar forms of speech, which we find in them, do in many instances help as much for the better illustration and better understanding of the New Testament as of the Old; the Jerusalem Chaldee dialect, in which they are written, being the vulgar language of the Jews in our Saviour's time. They also very much serve the Christian cause against the Jews, by interpreting many of the prophecies of the Messiah in the Old Testament in the same manner as the Christians do. Many instances are produced to this purpose by Dr Prideaux in his *Connect. of the Hist.* of the Old and New Testament, vol. iv. p. 777, &c.

These targums are published in the second edition of the great Hebrew Bible set forth at Basil by Buxtorf the father, anno 1610; for he has rectified the Chaldee text, and reformed the vowel pointings in it; the targums having at first been written without vowel points, which were afterwards added very erroneously by some Jews.

TARIF,

Tarif || Tartary.

TARIF, a table containing the names of different sorts of merchandise, with the duties to be paid as settled among trading nations.

TARPA, Spurius Mecius, a Latin critic in the time of Julius Cæsar and Augustus. He had his tribunal in the temple of Apollo, where, with four assistants, he passed sentence on the works of the poets. Cicero and Horace make honourable mention of this critic.

TARPAULIN, a piece of canvas, well tarred over, to keep off the rain from any place. The term is also often applied in a burlesque sense to a person that has been all his life bred to the sea.

TARPEIAN, in Roman antiquity, an appellation given to a steep rock in Rome; whence, by the law of the twelve tables, those guilty of certain crimes were precipitated. It took its name from Tarpeia, a vestal virgin, who was killed by the Sabines, as related under the article Rome, N° 24.

TARQUIN the Elder, king of Rome, succeeded Ancus Martius 615 B. C. See Rome, N° 35—40.

Tarquin the *Proud*, a tyrant and usurper. See Rome, N° 49—51, &c.

TARRAGON, or Dragon-wort. See Botany *Index*.

TARROCK, a species of lorus. See Ornithology *Index*.

TARSHISH, a town frequently mentioned by ancient authors, the situation of which it is difficult to ascertain. See Ophir.

TARTAN, in sea language, a small coasting vessel navigated in the Mediterranean, with only one mast and a bowsprit, the principal sail, which is very large, being extended by a lateen-yard. When tartans put up a square sail, it is called a *sail of fortune*.

TARTAR, a hard solid substance which separates from wine after complete fermentation, and adheres to the top and sides of the tasks. It is an impure tartrate of potash with the acid in excess. See Chemistry, N° 999.

TARTARIC acid. See Chemistry, p. 529.

1 Divisions.

TARTARY, a name given by geographers and historians to a considerable extent of territory in Asia, lying between Russia and China, and including a great variety of nations, now chiefly dependent on these two empires. The whole country is usually divided into *Western Tartary*, and *Eastern* or *Chinese Tartary*, of which the former includes Western Turkistan, Kharism, and Great Bucharia; while the latter comprehends the country of the *Monguls* and the *Mandshurs*, now both subject to Russia, and Little Bucharia. The geography of several parts of this extensive tract has already been considered under the articles Bucharia, China, and Russia, and we shall here confine ourselves to that which is now commonly known by the name of *Independent Tartary*, by which we understand that extent of country now possessed by the *Kirghises*, and the Usbeck Tartars, including the Kharism, and Great and Little Bucharia.

2 Extent, &c. of Independent Tartary.

Independent Tartary thus defined, extends from the Caspian sea on the west to the mountains of Belur on the east, a space of about 870 British miles, and from the mountains of Gaur in the south, to the southern boundaries of the Russian empire on the north, including nearly 1 500 British miles. About half of this extent is occupied by the Kirghises to the north, and the Usbecks to the south.

Tartary. 3 Kirghises.

The country of the Kirghises is separated from Siberia by the great steppe or desert of Issim, an extensive plain intersected by a river of the same name, and abounding with lakes of salt and bitter waters. Even the soil of this steppe is in many places impregnated with salt and nitre, though in several spots the soil is by no means unfruitful. There are no towns, as the inhabitants dwell wholly in tents.

The Kirghises have been long divided into three principal hordes, called the *great*, *middle*, and *lesser*. Of these, the two latter are now regarded as subjects of the Russian empire, though they seem by no means to be dependent on that power. The great horde, defended by mountains on the south and east, are properly independent. This last horde is supposed to contain about 60,000 families, while the lesser and middle hordes are said to comprehend each about half that number. The whole population is computed at about 500,000.

The Kirghises have gradually moved from the east towards the west. Their manners are described at considerable length by Pallas. Their tents are of a sort of felt; their drink kumiss, made of acidulated mares milk. The great horde is considered as the source of the other two. Being settled near the mountains of Alak, or *Ala Tau*, this horde has been called the Alatanian Kirghises. They lead a wandering life, from the borders of the Upper Sirr, near Tashkund, to the steppe of Issim. Each horde has its particular khan; but the middle horde, when Pallas visited this country, was contented with a prince, who seemed to acknowledge the khan of the lesser horde; and in 1777, this khan was called Nur Hali, an equitable prince. Their features are Tartaric, with flat nose and small eyes, but not oblique like those of the Monguls and Chinese. They have horses, camels, cattle, sheep, and goats. Some individuals of the middle horde, it is said, had 10,000 horses, 300 camels, 4000 cattle, 20,000 sheep, and upwards of 2000 goats; while in the lesser horde were proprietors of 5000 horses, and a proportional number of the other animals. Their dromedaries furnish a considerable quantity of woolly hair, sold to the Russians and Bucharians, being annually clipped like that of sheep. Their chief food is mutton; and the lamb is so exquisite, that it is sent from Orenburg to St Petersburg for the tables of the palace. The lamb skins are the most celebrated next to those of Bucharia; but the wool of the sheep is coarse, and used only for domestic purposes, for felts and thick cloths. The steppes supply them with objects of the chace, wolves, foxes, marmots, antelopes, &c. In the southern and eastern mountains are found wild sheep, the ox of Tibet, which seems to delight in snowy alps; with chacals, tigers, and wild asses.

As the Kirghisians regard each other as brethren, they are obliged to employ slaves who are captives taken in their incursions. Their dress consists of close vests, large trowsers and pointed boots. The ladies adorn their heads with the necks of herons, disposed like horns. They appear to be Mahometans, but have a more relaxed creed.

The Kirghisians carry on some trade with Russia. The chief traffic is at Orenburg, and wholly by exchange; but the middle horde proceed to Omsk. About 150,000 sheep are annually brought to Orenburg, with horses, cattle, lamb skins, camels wool, and sometimes slaves.

Tartary.

ſlaves. In return they take manufactured articles, chiefly clothes and furniture. From Bucharia, Khiva, and Taſhkund, they receive arms and coats-of-mail, which Ruſſia refuſes, in return for camels and cattle. They are extremely fond of the Kalmuk women, who long retain their charms; and often marry them if they will adopt the Mahometan religion. They have an annual feſtival in honour of the dead. About the beginning of the 17th century this people, who were formerly Shamanians, became children of circumciſion, by the exertions of the prieſts of Turkiſtan.

4 Uſbeks.

The country of the Uſbek Tartars includes Kharifm and part of Great Bucharia. The former of theſe extends from the river Gihon to the Caſpian ſea, and is bounded on the north and eaſt by vaſt deſerts. Its length is about 400 Britiſh miles, and its breadth rather leſs than 350. The chief town is Khiva, beſides which there are five walled cities or towns, within half a day's journey of each other. The khan is abſolute, and independent of any but the high prieſt, or lama, by whom he is controlled. The Kievinſki Tartars differ little from the Kirghiſes, but ſurpaſs even them in treachery. Their manners are nearly the ſame, except that the Kirghiſes live in tents, while the others inhabit cities and villages. Their only trade is with Bokhara and Perſia; whither they carry cattle, furs, and hides, which they procure from the Kirghiſes and Turkoman Tartars. The place itſelf produces little more than cotton, lamb furs, of a bad quaiity, and ſome raw ſilk; part of which they manufacture. The town of Khiva ſtands on a riſing ground, with three gates, and a ſtrong thick wall of earth much higher than the houſes, with turrets at ſmall diſtances, and a broad deep ditch full of water. It occupies a large ſpace, and commands a pleaſant proſpect; but the houſes are built with mud, having flat roofs covered with earth. It is 17 days journey from the Caſpian ſea, and 33 from Orenburg, allowing 40 verſts to the day's journey.

5 Town of Khiva.

The people of Khiva bring to Orenburg large quantities of raw cotton; but the coaſts of the Caſpian are held by ſome remains of Turkomans in the north, and by Uſbeks in the ſouth. A conſiderable trade is carried on with Manguſhlak. As the merchants of Khiva brought gold and gems to Aſtrakan, probably from the two Bucharias, it was ſuggeſted to Peter the Great that theſe products were found in Kharifm, in conſequence of which he attempted a ſettlement. But the Ruſſians, to the number of 3000, were cut off by the Uſbeks.

6 Great Bucharia.

Great Bucharia, by far the moſt important part of Independent Tartary, extends for about 700 Britiſh miles in length from north to ſouth, by a medial breadth of about 350, being bounded on the north by the mountains of Argun, and divided from Kharifm and Corazan by the river Amu, and extenſive deſerts, while on the ſouth and eaſt it has for its boundaries the mountains of Gaur and of Beber.

The chief city of Great Bucharia is SAMARCAND, on the ſouthern bank of the river Sogd. The other places of note are BOKHARA on the ſame river, Balk on the river Dehaſh, Zouf, and Kotlan.

The face of the country preſents a great variety, abounding with rivers, hills, and mountains, but being in general deficient in wood. Near the rivers the ſoil is very productive, the graſs ſometimes exceeding the height of a man; and in ſome parts much induſtry is ſhown in the cultivation of rice and other grain.

The rivers are, the Amu and Sirr. Beſides the ſea of Aral, already deſcribed under that head, there are ſeveral conſiderable lakes, particularly that of Palkati, Tengis, or Balcaſh, being about 140 miles long by 70 broad.

"In all the regions of the earth, (ſays Sir William Ouſeley) there is not a more flouriſhing or a more delightful country than this, eſpecially the diſtrict of Bokhara. If a perſon ſtand on the Kohendis (or ancient caſtle) of Bokhara, and caſt his eyes around, he ſhall not ſee any thing but beautiful and luxuriant verdure on every ſide of the country; ſo that he would imagine the green of the earth and the azure of the heavens were united; and as there are green fields in every quarter, ſo there are villas interſperſed among the green fields. The Sogd, for eight days journey, is all delightful country, affording fine proſpects, and full of gardens, and orchards, and villages, corn fields, and villas, running ſtreams, reſervoirs, and fountains, both on the right hand and on the left. You paſs from corn fields into rich meadows and paſture lands; and the ſtraits of Sogd are the fineſt in the world."

7 Religion of the Tartars.

The religion of the Uſbeks and Bucharians is the Mahométan of the Sunni ſect, and the government of the khans is deſpotic. There are no accounts to be met with of the ſtate of the population, but it is believed that on any emergency they could muſter an army of 100,000. The revenue of theſe fertile provinces is not certainly known, though that of Coraſan is ſaid to amount to half a million ſterling annually, and it is probable that the revenue of Great Bucharia is at leaſt equal to that of Coraſan.

8 Trade.

Beſides the caravans to Perſia, Hindoſtan, and China, ſome trade is carried on with the Ruſſians; the Bucharian merchants not only furniſhing their own products, but others from the eaſtern countries to which they trade.

9 Manners.

The manners and cuſtoms of the Uſbeks are ſimilar to thoſe of the other Tartars; but they are ſuppoſed to be the moſt ſpirited and induſtrious of theſe barbarians. Though many reſide in tents in the ſummer, yet in winter they inhabit the towns and villages. They are accuſtomed to make ſudden inroads into the Perſian provinces. The native Bucharians are comparatively fair, and correſpond in form and features with thoſe of Little Bucharia. The Bucharians never bear arms. The Uzbeks, on the contrary, are no ſtrangers to the uſe of the muſket, and it is ſaid that even their women are not averſe to warfare. The language is Turkiſh, but that of the Bucharians has never been inveſtigated, though it be probably a dialect of the Perſian. Their literature would furniſh an ample theme, Samarcand having been a celebrated ſchool of oriental ſcience, cultivated even by monarchs, as Ulug Beg and others.

"Such are the generoſity and liberality of the inhabitants, that no one (ſays Sir William Ouſeley) turns aſide from the rites of hoſpitality; ſo that a perſon contemplating them in this light, would imagine *that all the families of the land were but one houſe.* When a traveller arrives there, every perſon endeavours to attract him to himſelf, that he may have opportunities of performing kind offices for the ſtranger; and the beſt proof of their hoſpitable and generous diſpoſition is that every

every peaſant, though poſſeſſing but a bare ſufficiency, allots a portion of his cottage for the reception of a gueſt. On the arrival of a ſtranger they contend one with another for the pleaſure of taking him to their home, and entertaining him. Thus, in acts of hoſpitality, they exceed their incomes. I happened once to be in Sogd, and there I ſaw a certain palace, or great building, the doors of which were faſtened back with nails againſt the walls. I aſked the reaſon of this, and they informed me that it was a hundred years and more ſince thoſe doors had been ſhut, all that time they had continued open day and night; ſtrangers might arrive there at the moſt unſeaſonable hours, or in any numbers, for the maſter of the houſe had provided every thing neceſſary both for the men and for their beaſts; and he appeared with a delighted and joyful countenance when the gueſts tarried a while."

For a more particular account of the manners and cuſtoms of the Tartars, ſee the articles BUKHARIA and KALMUKS; Pallas's *Travels in the Southern Provinces of the Ruſſian Empire*, and Tooke's *View of the Ruſſian Empire*. An account of the Baſchkirs, alſo a tribe of wandering Tartars, and of the Tartars of the Krimea, has been given under RUSSIA.

We cannot here enter on the hiſtory of Tartary. The moſt intereſting parts of it will be found under the articles CHINA and MOGUL, and we may refer thoſe who wiſh for a more detailed account to the 4th volume of the *Modern Univerſal Hiſtory*, and to the *Aſiatic Reſearches*.

Krim TARTARY. See CRIMEA.

TARTRATES, in *Chemiſtry*, are ſaline bodies, compoſed of an alkaline, earthy, or metallic baſe, and tartaric acid.

TASSEL, a pendant ornament at the corners of a cuſhion, &c. In building, taſſels denote thoſe pieces of board that lie under the ends of the mantlet trees.

TASSO, TORQUATO, a celebrated Italian poet, was born at Sorrento in the kingdom of Naples, in 1544. He was the ſon of Bernardo Taſſo, and of Portia de Roſſi, a lady of an illuſtrious family of Naples.

At three years of age Taſſo was committed by his father to the care of Angeluzza, a man of great learning, who at this tender age, it is ſaid, began to teach him grammar; at four he was ſent to the Jeſuits college, and at ſeven was well acquainted with Latin and Greek. At the age of 12 he went from Rome to Mantua, where his father had entered into the ſervice of the duke Guglielmo Gonzaga; he had then completed his knowledge of the Latin and Greek languages; he was well acquainted with rhetoric and poetry, and maſter of Ariſtotle's Ethics. He was ſoon after ſent to the univerſity of Padua; and at 18, publiſhed his Rinaldo, a poem on the plan of Homer's Odyſſey. This extended his fame through all Italy; but his father went to Padua, to remonſtrate againſt his apparent purpoſe of giving himſelf up to philoſophy and poetry, and made uſe of many harſh expreſſions, which Taſſo heard with great patience. "Of what uſe is that philoſophy on which you value yourſelf ſo much?" "It has enabled me (replied Taſſo) to endure the harſhneſs of your reproofs."

He ſoon after went to Bologna, by the invitation of the city and college; but in a ſhort time he returned to Padua at the urgent deſire of Scipio Gonzaga, who had been elected prince of the academy eſtabliſhed in that city under the name of the *Ætherei*. In this retreat he formed the deſign of his *Jeruſalem Delivered*, invented the fable, diſpoſed the parts, and determined to dedicate it to the houſe of Eſte; and being preſſed to reſide at Ferrara, he gave his conſent. The duke of Ferrara gave him an apartment in his palace, where he lived in peace and affluence, and proſecuted his work, which he determined to dedicate to the duke, and which was publiſhed book by book, as he finiſhed them.

At the age of 30 he finiſhed his *Jeruſalem*, and the whole was reprinted and publiſhed together, the ſucceſs of which was aſtoniſhing. It was tranſlated into Latin, French, Spaniſh, and even the oriental languages, almoſt as ſoon as it appeared. Soon after the publication of his *Jeruſalem* he loſt his father, who had been appointed governor of Oſtia on the Po by the duke of Mantua; and a pretended friend to Taſſo, belonging to Ferrara, to whom he had incautiouſly committed ſome tranſactions of a very delicate nature concerning his patron the duke, had the perfidy to betray him. This coming to the ears of the duke, he ſhut up Taſſo in priſon, from which, however, he found means to eſcape, after a year's confinement, and retired to Turin, being then about 34 years of age, and was recommended to the duke of Savoy, who ſhowed him many marks of eſteem and regard. Fearing, however, that he might be delivered up to the duke of Mantua, he ſecretly retired to Rome, and went directly to his friend Mauritio Cataneo, by whom he was received with great kindneſs, and his preſence made the whole city rejoice. Here he endeavoured to make his peace with the duke, and was fortunate enough to ſucceed.

After this he lived at Mantua about a year, in great favour with the prince; but growing weary of a ſtate of dependence, he reſolved to go to Naples, and endeavour to recover his mother's jointure, which had been ſeized by her relations; but as this law ſuit had no appearance of being ſoon determined, he went from Naples to Rome, where he continued about a year, in high favour with Pope Sextus Quintus, and then went to Florence, at the earneſt deſire of Ferdinando, grand duke of Tuſcany, who had been cardinal at Rome when Taſſo firſt reſided there.

Having ſpent another year at Florence, he returned to Naples, where he corrected his Jeruſalem Delivered.

Cardinal Cynthio, who was a great patron of learning and genius, and knew Taſſo when he firſt reſided at Rome, prevailed with him once more to leave his retreat at Naples and live with him in that city, where he continued till he was 50, and then returned to Naples to proſecute his law ſuit, from which place, however, he was ſoon recalled; and being introduced to the pope, his holineſs ſaid, "that his merit would confer as much honour on the laurel he was about to receive, as the laurel had formerly conferred on others."

It happened that while they waited for fair weather, for the purpoſe of celebrating the ſolemnity of Taſſo's coronation with laurel, that great poet took his laſt illneſs, and died on the 15th day of his ſickneſs, aged 51. His poems have acquired him an immortal reputation, the chief of which are, 1. Jeruſalem Delivered. 2. Jeruſalem Conquered. 3. Rinaldo. 4. The Seven Days of the Creation. 5. The Tragedy of Torimond.

6.

Taste. 6. Aminta, &c. All his works were printed together at Florence in 1724, in 6 vols. folio, with the pieces for and against his Jerusalem Delivered.

TASTE, a certain sensation excited in the mind by certain bodies, which are called *sapid*, applied to the tongue and palate, and moistened with saliva. This is the original and proper meaning of the word *taste* (see METAPHYSICS, N° 46.); but as the qualities of bodies which produce these sensations are unknown, they have got the names of the sensations themselves, by substituting the cause for the effect. Tastes have been divided into simple and compound, and philosophers have endeavoured to ascertain the number of each species. Attempts have likewise been made to determine from their tastes the effects of different substances on the human body, taken into the stomach as food or physic; but by stating the results of such inquiries, we should be more likely to mislead than to communicate useful information.

TASTE is likewise used in a figurative sense, to denote that faculty by which we perceive whatever is beautiful or sublime in the works of nature or of art. This faculty relishes some things, is disgusted with others, and to many is indifferent. It has also been called an internal *sense*, and by one philosopher, a *reflex sense*, while others have considered it as the joint exertion of perception and judgement in some cases, and as a play of the imagination in others.

To decide among these different opinions, it will be necessary to ascertain, if we can, what are the objects of this faculty. *Scarlet*, *blue*, *green*, and *yellow*, are all beautiful colours, and a *cube* and a *sphere* are beautiful figures; but it does not appear to us, that a man could be said to have either a good or a bad taste for relishing the perception of a *scarlet* more than that of a *yellow* colour, or a *spherical* more than a *cubical* figure.

With respect to the objects of the external sense, we are so constituted by nature as to relish those kinds of food which are most wholesome, and such a taste is justly said to be sound and uncorrupted. It is in the highest perfection too at first, for it depends not on culture of any kind, and is incapable of improvement. The reverse is the case with respect to internal taste. Every voice, it is true, unites in applauding elegance, simplicity, spirit in writing, and in blaming affectation, or a false brilliancy; but when critics come to particulars, this seeming unanimity vanishes. Perhaps no man ever beheld the rising or setting sun without feeling emotions of pleasure; yet it is certain that the emotions of the clown are not the same, at least in degree, with those of the philosopher. Any beautiful object presented to the eye, gives a pleasing sensation to the mind; and it appears to us that the clown feels nothing more than a mere sensation from the view of the rising sun, similar to what he would feel from a blazing heath. In poetry and painting the vulgar are always delighted with the melody of the verse, and the brilliancy of the colours, and think of nothing else as beauties.

If this be so, the pleasures which the vulgar derive from what are called objects of taste, are mere gratifications of the senses; but very different is the pleasure which the man of cultivated taste derives from the beauties of nature or of art. The mere sensation of the clown is followed by a train of ideas which hurries him beyond the object before him to its beneficent effects and its Almighty Creator. Taste.

The nature of any person's taste, therefore, is generally determined from the character of his imagination and the soundness of his judgement. The simple perception of the object we find is insufficient to excite these emotions, unless it is accompanied with this operation of mind. Thus, when we feel the beauty or sublimity of natural scenery, we are conscious of a variety of images in our minds, very different from those which the objects themselves can present to the eye.

If the mind is in such a state as to prevent this freedom of imagination, the emotion is not perceived. In so far as the beauties of nature or art affect the external senses, their effect is the same on every man who is in possession of these senses. But to a man in pain or in grief, the same scene will not produce any feeling of admiration, which at other times would have produced it in perfection.

There are many objects of taste which produce not their full effect on the imagination, but through the medium of the judgement. The beauty of the Farnese Hercules is one kind of beauty; that of the gladiators in the palace of Chighi, another; and that of the Apollo Belvidere a third. Each of these figures is acknowledged to be perfect in its kind; but according to Sir Joshua Reynolds, the highest perfection of the human figure is not to be found but in that form which might be taken from them all, and which would partake of the activity of the gladiator, of the delicacy of the Apollo, and of the muscular strength of the Hercules. In this view the perfection of these statues consists in something which being perceived by the eye, is referred by the understanding to what we know of the characters of Hercules, Apollo, and the gladiator, and which we suppose it was the intention of the statuaries to express. There are besides, objects of which taste is sometimes said to judge, though they have little or no effect whatever on the imagination. A book of abstract science, written in a prolix and intricate stile, may be said to be in a bad taste; and had Swift, in his clear and simple stile, written an *Essay on the Human Understanding*, his work, supposing him master of the subject, would undoubtedly have displayed more taste than Locke's, in which the terms are sometimes vague, and the period often encumbered. This is the case of Berkeley, who is admitted by all to have been a writer of good taste, though neither the Principles of Human Knowledge, the Dialogues on Matter, nor the Minute Philosopher, is capable of affording pleasure, either to the senses or the imagination. His beauty consists merely in the perspicuity of his stile, of which the understanding alone is the judge. The metaphysical writings of Dr Reid possess in an eminent degree the same beauty; and no man of true taste can read them without admiring the elegant simplicity of the composition as much as the strength of the reasoning, and feeling from the whole a pleasure which the poetical style of Shaftesbury cannot communicate.

If this be a just account of the pleasures of taste, that faculty cannot be properly considered as a mere internal sense, since to its enjoyments a well-stored fancy is necessary in some cases, and the reasoning power in all; and the poet and the painter who wished to excel in their

Taste.

their respective professions, must not content themselves, the one with filling the ear of the reader with mellifluous sounds, and the other with dazzling or deceiving the eye of the spectator by the brilliancy of his colours, but both must strive for fame by captivating the imagination; whilst the architect, who aspires to a similar celebrity, must make the purpose of his ornaments obvious to every person capable of judging. The landscapes of Claude Lorrain, the music of Handel, and poetry of Milton, excite feeble emotions in our minds, when our attention is confined to the qualities they present to our senses, or when it is to such qualities of their composition that we turn our regard. It is then only we feel the sublimity or beauty of their productions, when our imaginations are kindled by their power, when we lose ourselves amid the number of images that pass before our minds, and when we waken at last from this play of fancy as from the charm of a romantic dream.

It is well observed by Sir Joshua Reynolds* that taste is sometimes praised in such terms by orators and poets, who call it *inspiration*, and *a gift from heaven*, that though a student by such praise may have his attention roused, and a desire excited of obtaining this gift, he is more likely to be deterred than encouraged in the pursuit of his object. "He examines his own mind, and perceives *there* nothing of that divine inspiration with which he is told so many others have been favoured. He never travelled to heaven to gather new ideas; and he finds himself possessed of no other qualifications than what mere common observation and a plain understanding are able to confer. Thus he becomes gloomy amidst the splendour of figurative declamation, and thinks it hopeless to pursue an object which he supposes out of the reach of human industry. But on this, as on many other occasions, we ought to distinguish how much is to be given to enthusiasm, and how much to common sense; taking care not to lose in terms of vague admiration that solidity and truth of principle upon which alone we can reason." Whoever possesses the ordinary powers of perception, sensibility of heart, good sense, and an imagination capable of being roused by the striking objects of nature and of art, may, without inspiration, become, by mere experience, a man of fine taste in the objects of which he aspires to be a critical judge.

*Discourse delivered at the Royal Academy, Dec. 14. 1770.

This being the case, we may easily account for the variety of tastes which prevail among men, not only as individuals but as nations. We have already mentioned the difference in one instance between the European taste and the African respecting female beauty; and we may now affirm, as we hope to prove our affirmation, that the one taste is equally correct with the other. The charms of female beauty exist not in the mere external form and colour considered by themselves (for then the inanimate statue of the Venus de Medicis would give more delight to the European beholder than the finest woman that ever lived); but we associate external beauty with sweetness of disposition, and with all the train of endearments which take place in the union of the sexes; and it is this association which delights the man of taste, as giving refinement to an appetite which itself is gross and sensual. A similar association must be formed in the breast of the African who has any taste; and as he never knew feminine softness, or any of the endearing qualities of the sex, but as united with thick lips, a flat nose, a black skin, and woolly hair—a sable beauty of that description must excite in his breast the same emotions that are excited in the breast of an European by the fair woman with Grecian features.

But is there not an ideal or perfect beauty of the human form? There certainly is, as of every other natural object; but it cannot be the same in Europe as in Africa, unless to a Being who is acquainted with all the peculiarities of form, national and individual, that are to be found among the inhabitants of the whole earth. It has been supposed, and we think completely proved, by one of the best writers that we have on the philosophy of taste*, that the sublimity or beauty of forms arises altogether from the associations we connect with them, or the qualities of which they are expressive to us. The qualities expressed by the male and female forms are very different; and we would by no means think the woman beautiful who should have the form of the Farnese Hercules, or admire the shapes of the hero who should be formed like the Venus de Medicis; because the proportions of such a woman would indicate strength and intrepidity, where we wish to find only gentleness and delicacy; and the delicate form of the hero would indicate softness and effeminacy, where the opposite qualities only can be esteemed. As we associate with the female form many desirable qualities, every woman is esteemed more or less beautiful as her figure and features indicate a greater or smaller number of these qualities; and the same is the case with respect to the qualities which adorn the male character, and the form and features by which they are expressed. Upon comparing a number of human beings with one another, we find, that with respect to every feature and limb, there is one central form to which nature always tends, though she be continually deviating from it on the right hand and on the left: (See NOSE). This form therefore is considered as the most perfect form of the species, and most expressive of the qualities for which that species is valued; but in Africa, the central form, with respect to the proportions of the human body and the features of the human face, is very different from what it is in Europe; and therefore the ideal or perfect beauty of the human form and features cannot be the same in both countries. No doubt, if a man could examine the limbs and features of every individual of the human race, he would discover one central form belonging to the whole, and be led to esteem it the standard of beauty; but as this is obviously impossible, the common idea or central form belonging to each great class of mankind must be esteemed the standard of beauty in that class, as indicating most completely the qualities for which individuals are esteemed. Thus there is a common form in childhood and a common form in age; each of which is the more perfect as it is the more remote from peculiarities: but though age and childhood have something in common, we should not deem the child beautiful who was formed exactly like the most handsome man, nor the man handsome who was formed exactly like the most beautiful child. This doctrine is well illustrated by Sir Joshua Reynolds, who has applied it to every object esteemed beautiful in nature; and proved, that the superiority of Claude Lorrain over the landscape painters of the Dutch and Flemish

*Mr Alison.

Taste.

Flemiſh ſchools, ariſe chiefly from his having generalized his conceptions, and formed his pictures by compounding together the various draughts which he had previouſly made from various beautiful ſcenes and proſpects. "On the whole (ſays he), it ſeems to me that there is but one preſiding principle which regulates and gives ſtability to every art. The works, whether of poets, painters, moraliſts, or hiſtorians, which are built upon general nature, live for ever; while thoſe which depend for their exiſtence on particular cuſtoms and habits, a particular view of nature, or the fluctuation of faſhion, can only be coeval with that which firſt raiſed them from obſcurity. All the individual objects which are exhibited to our view by nature, upon cloſe examination, will be found to have their blemiſhes and defects. The moſt beautiful forms have ſomething about them like weakneſs, minuteneſs, or imperfection. But it is not every eye that perceives theſe blemiſhes: It muſt be an eye long uſed to the contemplation and compariſon of theſe forms; which alone can diſcern what any ſet of objects of the ſame kind has in common, and what each wants in particular."

From theſe reaſonings the ſame great artiſt concludes, that the man who is ambitious of the character of poſſeſſing a correct taſte, ought to acquire a "habit of comparing and digeſting his notions. He ought not to be wholly unacquainted with that part of philoſophy which gives him an inſight into human nature, and relates to the manners, characters, paſſions, and affections. He ought to know *ſomething* concerning *mind*, as well as a great deal concerning the *body*, and the various external works of nature and of art; for it is only the power of diſtinguiſhing right from wrong that is properly denominated *taſte*.

"Genius and taſte, in the common acceptation, appear to be very nearly related; the difference lies only in this, that genius has ſuperadded to it a habit or power of execution. Or we may ſay, that taſte, when this power is added, changes its name, and is called *genius*. They both, in the popular opinion, pretend to an entire exemption from the reſtraint of rules. It is ſuppoſed that their powers are intuitive; that under the name of *genius* great works are produced, and under the name of *taſte* an exact judgement is given, without our knowing why, and without being under the leaſt obligation to reaſon, precept, or experience.

"One can ſcarce ſtate theſe opinions without expoſing their abſurdity; yet they are conſtantly in the mouths of men, and particularly of illiterate and affected connoiſſeurs. The natural appetite, or taſte of the human mind, is for *truth;* whether that truth reſults from the real agreement or equality of original ideas among themſelves, from the agreement of the repreſentation of any object with the thing repreſented, or from the correſpondence of the ſeveral parts of any arrangement with each other. It is the very ſame taſte which reliſhes a demonſtration in geometry, that is pleaſed with the reſemblance of a picture to an original, and touched with the harmony of muſic.

"But beſides *real*, there is alſo *apparent* truth, or opinion, or prejudice. With regard to real truth, when it is known, the taſte which conforms to it is and muſt be uniform. With regard to the ſecond ſort of truth, which may be called *truth upon ſufferance*, or *truth by courteſy*, it is not fixed but variable. However, whilſt theſe opinions and prejudices on which it is founded continue, they operate as truth; and the art, whoſe office it is to pleaſe the mind as well as inſtruct it, muſt direct itſelf according to *opinion*, or it will not attain its end. In proportion as theſe prejudices are known to be generally diffuſed or long received, the taſte which conforms to them approaches nearer to certainty, and to a ſort of reſemblance to real ſcience, even where opinions are found to be no better than prejudices. And ſince they deſerve, on account of their duration and extent, to be conſidered as really true, they become capable of no ſmall degree of ſtability and determination by their permanent and uniform nature.

"Of the judgement which we make on the works of art, and the preference that we give to one claſs of art over another, if a reaſon be demanded, the queſtion is perhaps evaded by anſwering, I judge from my taſte; but it does not follow that a better anſwer cannot be given, though for common gazers this may be ſufficient. Every man is not obliged to inveſtigate the cauſes of his approbation or diſlike. The arts would lie open for ever to caprice and caſualty, if thoſe who are to judge of their excellencies had no ſettled principles by which they are to regulate their deciſions, and the merit or defect of performances were to be determined by unguided fancy. And indeed we may venture to aſſert, that whatever ſpeculative knowledge is neceſſary to the artiſt, is equally and indiſpenſably neceſſary to the critic and the connoiſſeur.

"The firſt idea that occurs in the conſideration of what is fixed in art or in taſte, is that preſiding principle which we have already mentioned, the general idea of nature. The beginning, the middle, and the end of every thing that is valuable in taſte, is compriſed in the knowledge of what is truly nature; for whatever ideas are not conformable to thoſe of nature or univerſal opinion, muſt be conſidered as more or leſs capricious; the idea of nature comprehending not only the forms which nature produces, but alſo the nature and internal fabric and organization, as I may call it, of the human mind and imagination. General ideas, beauty, or nature, are but different ways of expreſſing the ſame thing, whether we apply theſe terms to ſtatues, poetry, or picture. Deformity is not nature, but an accidental deviation from her accuſtomed practice. This general idea therefore ought to be called *nature:* and nothing elſe, correctly ſpeaking, has a right to that name. Hence it plainly appears, that as a work is conducted under the influence of general ideas, or partial, it is principally to be conſidered as the effect of a good or a bad taſte."

Upon the whole, we may conclude that the real ſubſtance, as it may be called, of what goes under the name of *taſte*, is fixed and eſtabliſhed in the nature of things; that there are certain and regular cauſes by which the imagination and paſſions of men are affected; and that the knowledge of theſe cauſes is acquired by a laborious and diligent inveſtigation of nature, and by the ſame ſlow progreſs as wiſdom or knowledge of every kind, however inſtantaneous its operations may appear when thus acquired. A man of real taſte is always a man of judgement in other reſpects; and thoſe inventions which either diſdain or ſhrink from reaſon, are generally more like the dreams of a diſtempered brain than the exalted enthuſiaſm of a ſound and true genius. In the midſt of the higheſt flights of fancy or imagination, reaſon ought

to

to preſide from firſt to laſt; and he who ſhall decide on the beauties of any one of the fine arts by an imaginary innate ſenſe or feeling, will make as ridiculous an appearance as the connoiſſeur mentioned by Dr Moore, who praiſed as a work of the divine Raphael the wretched daubing by a Swiſs copyiſt. The reader who wiſhes for further inſtruction in the philoſophy of taſte, may conſult Gerard's Eſſay on Taſte, with the diſſertations of Voltaire, d'Alembert, and Monteſquieu; Dr Blair's Lectures on the Belles Lettres; Dr Reid's Eſſays on the Intellectual Powers of Man; Aliſon's Eſſays on the Nature and Principles of Taſte; and Sir Joſhua Reynold's Diſcourſes delivered in the Royal Academy.

TATE, Nahum, an Engliſh poet, born in Ireland about the middle of the reign of Charles II. where he received his education. He was made poet-laureat to King William upon the death of Shadwell, and held that place until the reign of George I. whoſe firſt birth-day ode he lived to write, and executed it with unuſual ſpirit. He died in the Mint in 1716. He was the author of nine dramatic performances, a great number of poems, and a verſion of the Pſalms in conjunction with Dr Brady.

TATIAN, a writer of the primitive church in the ſecond century. He was born in Aſſyria, and trained up in the heathen religion and learning. Coming over to Chriſtianity, he became the diſciple of Juſtin Martyr, whom he attended to Rome. While Juſtin lived, he continued ſteadily orthodox: but after Juſtin's death he made a ſchiſm, and became the author of a new ſect, condemning marriage, enjoining abſtinence from wine and animal food, and ſuffering only water to be uſed in the holy myſteries; whence his followers were called *Encratitæ* and *Hydroparaſtatæ*. None of his works are now extant but his piece againſt the Gentiles; or, as it is uſually entitled, his *Oration to the Greeks*.

TATIUS, Achilles, a native of Alexandria, was the author of a book on the ſphere, which Father Petau tranſlated into Latin. There is alſo attributed to him a Greek romance on the loves of Leucippe and Clitophon, of which Salmaſius has given a beautiful edition in Greek and Latin, with notes. Suidas ſays, that this Achilles Tatius was a Pagan, but that he afterwards embraced the Chriſtian religion, and became a biſhop. Photius mentions him in his Bibliotheca.

TATONNEUR. See Lemur, Mammalia *Index*.

TATTOOING, or Tattowing, an operation in uſe among the iſlanders in the South ſea for marking their bodies with figures of various kinds which they conſider as ornamental. It is performed by puncturing the ſkin, and rubbing a black colour into the wounds. The inſtrument uſed ſomewhat reſembles a comb, the teeth of which are repeatedly ſtruck into the ſkin by means of a ſmall mallet. It is very painful; but the children are forced by their relations to ſubmit to it.

TATTOU, a beat of a drum at night to advertiſe the ſoldiers to retreat, or repair to their quarters in the garriſon, or to their tents in a camp.

TAVERNIER, John Baptiſt, a French traveller, was born in 1605. In the courſe of 40 years he travelled ſix times to Turkey, Perſia, and the Eaſt Indies, and viſited all the countries in Europe, travelling moſtly on foot. His travels have been frequently reprinted in ſix volumes 12mo. He died on his ſeventh journey to the eaſt, at Moſcow, in 1686.

TAVIRA, or Tavila, a conſiderable town of Portugal, and capital of the province of Algarve, with a handſome caſtle, and one of the beſt harbours in the kingdom, defended by a fort. It is ſeated in a fertile country, at the mouth of the river Gilaon, between Cape Vincent and the ſtrait of Gibraltar, 100 miles weſt by north of Cadiz. W. Long. 7. 46. N. Lat. 37. 18.

TAVISTOCK, a town of Devonſhire in England, ſituated on the river Tavey or Tave. W. Long. 4. 12. N. Lat. 50. 37. It ſends two members to parliament, and gives the title of *marquis* to the noble family of Ruſſel duke of Bedford.

TAUNTON, a large, elegant, and well built town of Somerſetſhire, 146 miles from London. It conſiſts principally of four ſtreets paved and lighted; the market-place is ſpacious, and has a handſome market-houſe, with a town hall over it, which was finiſhed in 1773. It has an extenſive woollen manufactory; and in 1780 a ſilk manufactory was introduced. Its caſtle, the ruins of which remain, was in 1645 defended for the parliament by Colonel Blake againſt an army of 10,000 men under Lord Goring, but was diſmantled by Charles II. In 1685 the duke of Monmouth made this place his head-quarters. Its church, which is large and beautiful, is a fine ſpecimen of the florid Gothic ſtyle of architecture. The tower, which is lofty, is of excellent workmanſhip, crowned at the top with four ſtately pinnacles, 32 feet high. The whole perhaps is not equalled in the kingdom. Taunton is pleaſantly ſeated on the river Tone, which is navigable to Bridgewater; is reckoned the beſt town in the county; and ſends two members to parliament. W. Long. 3. 17. N. Lat. 50. 59.

TAURIS, or Tebris, a town of Perſia, and capital of Aderbeitzan. It was formerly the capital of Perſia, and is now the moſt conſiderable next to Iſpahan; for it contains 15,000 houſes, beſides many ſeparate ſhops, and about 200,000 inhabitants. It is about five miles in circumference, and carries on a prodigious trade in cotton, cloth, ſilks, gold and ſilver brocades, fine turbans, and ſhagreen leather. There are 300 caravanſeras, and 250 moſques. Some travellers ſuppoſe it to be the ancient Ecbatana; but of this there is no certainty. It is ſeated in a delightful plain, ſurrounded with mountains, from whence a ſtream iſſues, which runs through the city. E. Long. 47. 50. N. Lat. 38. 18.

TAURUS, a great chain of mountains in Aſia, which begin at the eaſtern part of Little Carimania, and extend very far into India. In different places they have different names.

Taurus, in *Aſtronomy*, one of the 12 ſigns of the zodiac.

TAUTOLOGY, a needleſs repeating of the ſame thing in different words.

TAWING, the art of dreſſing ſkins in white, ſo as to be fit for divers manufactures, particularly gloves, &c.

All ſkins may be tawed; but thoſe chiefly uſed for this purpoſe are lamb, ſheep, kid, and goat ſkins.

The method of tawing is this: Having cleared the

Tawing.

ſkins of wool or hair by means of lime, they are laid in a large vatt of wood or ſtone, ſet on the ground, full of water, in which quicklime has been ſlaked; wherein they are allowed to lie a month or ſix weeks, according as the weather is more or leſs hot, or as the ſkins are required to be more or leſs ſoft and pliant.

While they are in the vatt, the water and lime are changed twice, and the ſkins are taken out and put in again every day: and when they are taken out for the laſt time, they are laid all night to ſoak in a running water, to get out the greateſt part of the lime; and in the morning are laid together by ſixes one upon another, upon a wooden leg, and are ſcraped ſtoutly one after another, to get the fleſh off from the fleſhy ſide, with a cutting two-handled inſtrument called a *knife*; and then they cut off the legs (if they are not cut off before) and other ſuperfluous parts about the extremes. Then they are laid in a vatt or pit with a little water, where they are fulled with wooden peſtles for the ſpace of a quarter of an hour; and then the vatt is filled up with water, and they are rinſed in it.

In the next place, they are thrown on a clean pavement to drain, and afterwards caſt into a freſh pit of water, out of which they rinſe them well, and are laid again on the wooden leg, ſix at a time, with the hair ſide outermoſt: after which they rub a kind of whetſtone very briſkly, to ſoften and fit them to receive four or five more preparations, given them on the leg both on the fleſh ſide and the hair-ſide, with the knife, after the manner above mentioned.

After this they are put into a pit of water and wheaten bran, and ſtirred about in it with wooden poles, till the bran is perceived to ſtick to them, and then they are left: as they riſe of themſelves to the top of the water by a kind of fermentation, they are plunged down again to the bottom; and at the ſame time fire is ſet to the liquor, which burns as eaſily as if it were brandy, but goes out the moment the ſkins are all covered.

They repeat this operation as often as the ſkins riſe above the water; and when they have done riſing they take them out, lay them on the wooden leg, the fleſhy ſide outwards, and paſs the knife over them to ſcrape off the bran.

Having thus cleared them of the bran, they lay the ſkins in a large baſket, and load them with huge ſtones to promote their draining: and when they have drained ſufficiently, they give them their feeding; which is performed after the manner following:

For 100 of large ſheep ſkins, and for ſmaller in proportion, they take eight pounds of alum and three of ſea-ſalt, and melt the whole with water in a veſſel over the fire, pouring the ſolution out, while yet lukewarm, into a kind of trough, in which is twenty pounds of the fineſt wheat-flower, with the yolks of eight dozen of eggs; of all which is formed a kind of paſte, a little thicker than children's pap; which, when done, is put into another veſſel, to be uſed in the following manner.

They pour a quantity of hot water into the trough in which the paſte was prepared, mixing two ſpoonfuls of the paſte with it; to do which they uſe a wooden ſpoon, which contains juſt as much as is required for a dozen of ſkins: and when the whole is well diluted, two dozen of the ſkins are plunged into it; but they take care that the water be not too hot, which would ſpoil the paſte and burn the ſkins.

After they have lain ſome time in the trough they take them out, one after another, with the hand, and ſtretch them out; this they do twice: and after they have given them all their paſte, they put them into tubs, and there full them afreſh with wooden peſtles.

They then put them into a vatt, where they are ſuffered to lie for five or ſix days, or more; then they take them out in fair weather, and hang them to dry on cords or racks: and the quicker they are dried the better; for if they be too long a drying, the ſalt and alum within them are apt to make them riſe in a grain, which is an eſſential fault in this kind of dreſſing.

When the ſkins are dry, they are made up into bundles, and juſt dipt in fair water, and taken out and drained: they are then thrown into an empty tub; and after having lain ſome time are taken out and trampled under foot.

They then draw them over a flat iron inſtrument, the top of which is round like a battledore, and the bottom fixed into a wooden block, to ſtretch and open them; and having been opened, they are hung in the air upon cords to dry; and being dry, they are opened a ſecond time, by paſſing them again over the ſame inſtrument.

In the laſt place, they are laid on a table, pulled out, and laid ſmooth, and are then fit for ſale.

TAXATION. Beſides thoſe expences which are neceſſary to the exiſtence, or conducive to the comfort and enjoyment of private individuals, there are others of which the benefit is directly applicable to the whole ſociety. Theſe benefits indeed are chiefly of a negative kind, but they are not therefore the leſs eſſential. They conſiſt in the preſervation of perſon and property from that violence both internal and external, to which the irregular paſſions of human nature continually expoſe them. The regular adminiſtration of juſtice, and defence againſt foreign enemies, are ſo eſſential to the well-being of a people, that they can with no propriety heſitate, when neceſſary, to part even with a large portion of their income in order to provide for the proper accompliſhment of theſe objects. A certain pomp and magnificence too, in thoſe who are to take the lead in theſe departments, have been deemed both ornamental to the ſociety, and neceſſary for ſecuring reſpect and obedience from the body of the people. If, beſides theſe grand and indiſpenſable advantages of foreign and internal ſecurity, public funds can be applied to any other purpoſes, evidently tending to promote the national well-being, yet beyond the reach of private exertions,—to canals, high roads, or public inſtitutions of any deſcription,—there can be no doubt ſurely as to the propriety of ſuch an application.

It is evident, therefore, that the money which is neceſſary for the above purpoſes, forms a perfectly neceſſary and proper part of national expenditure. The government of the country, indeed may, as elſewhere obſerved (POLITICAL ECONOMY), economically ſpeaking, be conſidered as part of its fixed capital, eſſential to the advantageous employment of the reſt. Without the ſecurity which the labourer thence derives, of reaping the fruits of his induſtry, he would have little motive to action; every thing would be the prey of the ſtrongeſt, and

Taxation.

and all impulse to activity ceasing, universal poverty would ensue. At the same time we may observe with regard to this as to other fixed capitals, that the expence is expedient only so far as it is necessary, and that if the same functions can be performed at a smaller cost, a decided gain arises to the public. It becomes therefore an important object to inquire, in what manner the offices of government may be adequately performed, with the least burden on the people.

We have formerly, under the head of POLITICAL ECONOMY, slightly illustrated some leading principles respecting public revenue. But as the subject is important, we shall consider it here in somewhat greater detail.

Taxes may be arranged in the following manner. 1. *Assessed taxes*, or those which the subject is required to pay directly into the hands of the sovereign or commonwealth. Under this title are comprehended all the taxes which bear the above name; all income or capitation taxes, and every species of land taxes. These taxes are almost always intended to fall upon income. 2. Taxes upon commodities, which are paid, in the first instance, not by the consumer, but by the producer, or importer. These taxes fall upon consumption; the man who does not use the articles, pays no tax. They operate thus partly as sources of revenue, and partly as sumptuary laws. 3. *Stamp duties*, or duties upon those deeds which regulate the transference of property. These duties fall chiefly upon capital.

1. *Assessed Taxes.*—Assessed taxes, according to the above definition, seem to be the most simple and direct mode of raising a revenue. The money comes at once from the pockets of the people into those of the sovereign. No tax is so certain of yielding a revenue. The money is demanded, and must be paid. Where properly arranged also, they may probably be made to fall more equally than any other, upon the different classes, according to their ability. In absolute governments, therefore, and in governments little skilled in the science of finance, these taxes are commonly preferred, as those which can be levied with the least trouble. They have likewise this merit that they cost little in the collection, and consequently nearly their whole amount is brought into the treasury.

Assessed taxes, however, are liable to many objections. None are so heavily felt. In other cases the tax is concealed under the price of the commodity with which it confounds itself; but here the money is paid directly without any thing in return. It must generally too be paid in a considerable sum at once, a circumstance which must often be productive of serious inconvenience, while the same sum, broken down into small portions, might have been paid without difficulty. For these reasons, much greater discontent is excited by these taxes than by taxes upon commodities. A double revenue perhaps, may, in the latter way, be raised with less murmuring. In popular governments, therefore, and in those where finance has been reduced to a system, the object has generally been to avoid direct assessment as much as possible. In this country, the greater part, by far, of the revenue had been raised by taxes upon commodities, till, within these last twenty years, the pressure of public wants made it necessary to have recourse to every mode of raising money which promised to be effectual, and thus the assessed taxes have been raised to a very great amount. The most important of these taxes may be included under *land tax*, *capitation taxes*, *house tax*, and *income tax*.

Land Tax.—There is no class of men who may with more propriety be burthened with an extraordinary imposition, than the proprietors of land. They enjoy commonly a liberal income, without care or trouble of their own. Their property, being of permanent value, is much preferable to any source of income which expires with its possessor. From being local and immoveable, it is peculiarly dependent on the protecting influence of government, and may therefore be reasonably called upon to contribute something more than the common share to its support. In almost all countries, therefore, the landholders, besides being liable to the same burdens with the rest of the society, are subject to a peculiar tax, called *land tax*.

In India and other great oriental empires, the principal revenue of the sovereign is derived from land. It arises, however, not properly in the way of tax, but of rent. The sovereign, in those absolute governments, is judged to be the sole proprietor of all the land in his dominions, which are let out by him or his deputy, to the farmers. This is also the principal source of the revenue which we derive from our East Indian possessions. It is otherwise, however, in all the European countries. There, almost all the land is private property, and the contribution which government draws from it is therefore a tax.

The adherents of the economical system have proposed to substitute a land tax in the room of every other. They maintain that all taxes must finally fall upon the produce of land, since it alone affords that surplus revenue, out of which public contributions can be drawn. Were this doctrine true, much trouble and expence would doubtless be saved, exchanging the present complicated and laborious system of taxation, for one so simple and easy. But we have already endeavoured to show, under the head of POLITICAL ECONOMY, that the principles of this sect have no solid foundation; that manufactures and commerce are sources of wealth, as well as agriculture, though in a somewhat inferior degree. It will follow, therefore, that they are equally liable to be affected by taxation. It is in vain to urge that the merchant must have his profit, and the labourer his hire, and that otherwise they will not employ their capital and labour. Were a tax to be imposed upon any one branch of industry, leaving the rest untouched, there is no doubt, that wages and profit in that branch must rise, till the merchant or labourer is placed on a level with the rest of the community, otherwise he will transfer his capital and industry to some other branch. But where the imposition falls indiscriminately upon the different employments of labour and stock, there is no such refuge; the labourer and merchant must suffer a diminution of income; nor is there any process by which he can throw this diminution upon the landlord.

Other persons of a much less informed character, are often heard urging, that we have only to lay the imposition upon the landlords; and that they will not be long of indemnifying themselves by raising the rent of their lands. Such arguments will make little impression upon those who have at all attended to the true principles of political economy. The value of lands, as of every other article, is determined by the demand and the

Taxation.

the ſupply. A tax upon the rent of land would have no tendency, either to increaſe the one, or to diminiſh the other, conſequently no tendency to raiſe the value of land. Indeed, were we to ſuppoſe, according to this hypotheſis, that proprietors have an unlimited power of raiſing their lands, whenever they are ſo inclined, it is quite contrary to common ſenſe to ſuppoſe that they ſhould not exert that power, without waiting for the ſtimulus of a tax.

For theſe reaſons, land cannot, with any propriety, be made the ſole ſubject of taxation; but it is very fair, as above obſerved, that it ſhould pay ſomewhat more than other ſources of revenue. A difficulty, however, ariſes from the variations to which its value is ſubject, ſometimes on the decreaſing, but more commonly on the increaſing ſide. The rate which, at one time, is equitable, becomes quite otherwiſe at another. An attempt, on the part of government, to keep up a continual ſurvey of all the lands in the kingdom, would be attended with very heavy expence, and would, after all, be probably fruitleſs. Beſides, ſuch a meaſure would operate as a diſcouragement to the improvement of land, when ſo large a ſhare would go out of the hands of the improver. Theſe objections have weighed ſo ſtrongly with the legiſlature of this country, that they have not raiſed this tax, ſince its firſt impoſition in the reign of King William. It was then meant to be at the rate of four ſhillings in the pound, though in fact, it was by no means ſo much. It was alſo very unequally diſtributed, even at the beginning; a ſerious evil, which however, it might have required very great trouble to avoid. Since that time, a great and general riſe has taken place in the value of land, which has made this tax much higher ſtill, than when it was originally impoſed. It has alſo rendered it, however, ſtill more unequal. Although almoſt all the land in Great Britain has improved; yet this improvement has taken place in very different proportions, according as each diſtrict differed in natural advantages, and in the induſtry of the inhabitants. The land tax accordingly is, at the preſent moment, moſt exceedingly unequal; but as it fortunately happens, that there is ſcarcely a diſtrict in Great Britain which has not improved more or leſs, the general moderation of the tax has rendered its inequality leſs grievous.

A method has been propoſed of obviating this diſadvantage, by keeping a regiſter, in which the landlord and tenant ſhall be jointly obliged to enter the rent which the land bears, a new entry being made at every variation. A valuation may be made of the lands which the proprietor keeps in his own poſſeſſion. Something of this kind, it is ſaid, actually takes place in the Venetian territory. The diſcouragement to improvement indeed ſtill remains, but even this might be obviated by an equitable, and even liberal allowance being made, for any ſums which the landlord may ſatisfactorily prove to have been expended in this way. The chief objection to the plan ſeems to be the danger of colluſion between the farmer and landlord, who would have a mutual intereſt in repreſenting the rent as leſs than it really was. The agreement indeed might, by law, be made obligatory on the farmer only to the extent of the ſum regiſtered; but it may be doubtful, whether even this regulation would always be an adequate ſecurity againſt fraud. The valuations would neceſſarily depend a good deal upon the diſcretion of the revenue officer; which, in an arbitrary government at leaſt, might become a ſerious objection. The additional expence of ſuch a plan would be conſiderable; but, provided it could be made to anſwer the purpoſe, this ought not to deter from its adoption.

Frederick of Pruſſia impoſed a higher tax upon lands held by a noble, than upon thoſe held by a baſe tenure. He conceived that the privileges and flattering advantages of nobility were ſuch as to compenſate for this additional charge. We are rather diſpoſed to conſider this proceeding as ſevere. A nobleman, with the ſame income, is poorer than a commoner, becauſe he has a greater rank to ſupport; and in the preſent ſtate of Europe, a great proportion of the nobility are extremely poor. This extreme, however, is much better than that of France before the revolution, of the Auſtrian ſtates, and of moſt of the old governments of Europe. There the nobility, poſſeſſing the chief influence in the adminiſtration, had obtained for themſelves liberal exemptions, and thrown the principal weight of this, as of other taxes, upon the inferior orders. In Sardinia, and in ſome provinces of France, lands held by a noble tenure paid nothing whatever.

Some taxes upon land are proportioned, not to its rent, but to its produce. This is the caſe in the Aſiatic countries. In China, a tenth, and in India, a fifth of the whole produce of the land, are claimed by government. In England and Ireland, the church is ſupported by a tax of this kind, which is called *tithe*.

Theſe taxes are liable to two very great objections. They are, in the firſt place, unequal. It is rent only that can be the proper ſubject of taxation; that part of the produce which is neceſſary to pay the expence of cultivation, ought to remain untouched. But this expence is far greater in poor than in rich lands. In the former, perhaps, the produce may be little more than ſufficient to pay the expences incurred; while in rich lands, not only the neceſſity of labour is leſs, but the produce greater. If, by well employed capital, and coſtly cultivation, the farmer ſucceeds in extracting tolerable crops from an ungrateful ſoil, it is both cruel and unjuſt that he ſhould be obliged to pay as much as if he had no ſuch obſtacle to ſtruggle with.

But if this tax be objectionable on the ground of equity, it is ſtill more ſo, on that of expediency. The firſt excitement to labour and improvements of every kind, muſt undoubtedly be the proſpect of enjoying their fruits. Where the rate of taxation is fixed, this proſpect remains unimpaired; for whatever addition the proprietor or farmer can, by ſuch means, make to the produce of his land, is all his own. But the caſe is very different, when it muſt be ſo deeply ſhared in by perſons who have done nothing to forward this increaſe of produce. A ſovereign prince indeed may derive, from ſuch an arrangement, ſome motive to encourage agriculture, and improve the means of communication, ſo as to raiſe the value of its produce. But this advantage, which will ſcarcely ever counterbalance the attendant evils, diſappears altogether, when this impoſition is to be paid for the ſupport of an eccleſiaſtical body. Theſe, being only life-renters, and ſeldom poſſeſſed of much capital, cannot be expected to co-operate in

Taxation.

in any meaſure for the improvement of the lands. The jarrings too, which are likely to take place between the paſtor and his flock, form a moral argument againſt this mode of ſupport.

It muſt not be concealed, however, that a permanent commutation of tithes would be a meaſure little favourable to the intereſts of the clergy. It ſeems both juſt to themſelves, and advantageous to the public, that when the country is in a ſtate of improvement, this body ſhould not be left behind; it ſhould be able to keep pace with the other members of the ſociety. This it can never do, if it has merely a certain fixed ſum allotted for its maintenance, without the poſſibility of augmentation. This evil has, in fact, been ſeriouſly felt in the church of Scotland, the income of whoſe members, notwithſtanding all that has been done for their relief, is ſtill very inferior to what it was thirty or forty years ago. A ſource of income, which riſes or falls with the value of land, ſeems the moſt effectual mode of maintaining this proportion between the income of the clergy, and of the reſt of the ſociety; we need not, therefore wonder, that the clergy ſhould be ſo tenacious of it.

To reconcile theſe contrarieties, would certainly be attended with difficulty; yet it does not ſeem to be abſolutely impoſſible. The firſt object would be, to transfer the tax from the produce to the rent. This might be done by forming a correct eſtimate, on an average of a few years, of the value of the tithe; and then aſſigning a claim to ſuch a proportion of the rent, as would be equal to that value. This would remove all diſcouragements to the exertion of the cultivator. Thoſe which preſs againſt the exertions of the landlord would indeed remain in full force, though without any increaſe. In moſt caſes, theſe exertions would be of very ſmall importance, when compared with thoſe of the former. But, beſides, a ſcheme might probably be contrived ſimilar to that above ſuggeſted, by which the landlord might receive an adequate allowance for any improvements he might make.

The ground-rent of houſes forms part of the rent of land. In remote country ſituations, it is often no more than the ſame land would yield, if employed for the purpoſes of agriculture. But in the vicinity, and ſtill more in the heart of a great town, competition, and the value attached by convenience or faſhion to ſome particular ſituations, raiſe this rent to a very extravagant height.

Ground-rent ſeems to be a ſtill more proper ſubject of taxation than that of common land. It ariſes commonly from circumſtances entirely independent of any care or attention on the part of the proprietor. Yet ground rents have never been conſidered as a ſeparate ſubject of taxation. This has probably been from the difficulty of diſtinguiſhing them from the building rent. In every tax upon houſes, however, part muſt fall upon the ground rent, provided that be able to bear it. By diminiſhing the demand for houſes, it will diminiſh alſo the demand for ground to build them on.

Capitation or *Poll Taxes*,—afford one of the eaſieſt and moſt obvious modes of taxation. To lay an aſſeſſment upon every individual without exception, ſeems the moſt effectual mode of preventing all trouble, and leaving no room for evaſion. In moſt of the abſolute governments, where the ſovereign does not claim the ſole property of the lands, as in Turkey and Ruſſia, poll taxes are impoſed in lieu of land tax.

The rudeſt form of this impoſition is, when it is laid equally upon every individual. An equality of this kind is the moſt grievous inequality. To make the pooreſt ſubject pay as much as the richeſt, is palpably unjuſt. The only caſe, where ſuch a tax can be proper, is where it falls upon ſlaves. In this caſe, it is paid, not by the ſlave, but by the maſter. The number of ſlaves forms the moſt accurate teſt of the value of his property; and accordingly, in Ruſſia, an eſtate is deſcribed, not by the number of acres, but by the number of ſlaves which it contains. This tax has alſo the good property of encouraging manumiſſion. In all other caſes, ſuch a tax can only be rendered tolerable by its extreme moderation.

Nations were not long of perceiving the prepoſterous nature of this arrangement, and of ſeeking to ſubſtitute ſome more equitable one in its place. Fortune was evidently the moſt correct ſtandard to proceed upon; but a cloſe inquiſition into private concerns was conceived to be burdenſome and oppreſſive. If each individual were to report his own fortune, could the report be truſted to? If, on the other hand, the aſſeſſment were to be regulated by the officers of government, according to what they ſuppoſed to be his wealth, a door was opened to vexatious and arbitrary proceedings. In order to avoid theſe oppoſite dangers, it has been common to regulate the contribution according to the rank of the contributor, which it is ſuppoſed will bear at leaſt a certain proportion to his fortune. This was the caſe with the different poll taxes impoſed in this country during the reign of King William. It was the caſe alſo in France with regard to that part of the *taille* which fell upon the nobility. It is extremely unequal; for many men of rank have no fortune correſponding; and where it ſo happens, their rank impoveriſhes them, by the expence which is requiſite for its ſupport. Yet, as rank affords a certain approximation to fortune, it is certainly better to fix it according to that ſtandard, than to leave it to the arbitrary appointment of the officers of government. Inequality is a leſs evil than uncertainty.

In that part of the *taille* which fell upon the inferior orders, the latter mode was adopted. This tax was the ſubject perhaps of more grievous diſcontent, than any other which yielded an equal revenue. It cannot be ſuppoſed that the intendant ſhould not be often ſwayed by motives of favouritiſm, private intereſt, or private reſentment; and the very uncertainty to which the people were expoſed, formed a ſevere hardſhip. They were tempted to conceal their wealth, and even to employ inadequate inſtruments of trade or agriculture, in order to deceive the watchful eye of the intendant.

Houſe Tax.—In order to avoid the defects incident to the above modes of aſſeſſment, rent of houſes has been fixed upon as affording the beſt criterion of the amount of a man's income. It certainly affords a tolerable criterion of his expenditure; and though this may often differ conſiderably from his means, yet as it is rather the object of government to diſcourage profuſe expenditure, there may be no harm in ſuch an inequality.

The moſt equitable mode of taxing houſes, would evidently be in the proportion of their rent. In this country, accordingly, part of the land tax is made to fall upon the rent of houſes. This branch of the land

tax

Taxation.

tax is ſubject to the ſame inequalities, both original and acquired, as the other branches. The aſſeſſment, not upon each houſe, but upon each diſtrict, continues invariably the ſame. In general, it is ſtill higher than upon land. The value of houſes, however, has not riſen ſo invariably as that of land; hence, in ſome diſtricts where the population has decreaſed, the tax falls with conſiderable weight. Since that time another tax has been impoſed upon houſes which is in proportion to the rent, and varies with it. The heavieſt tax upon houſes, however, is now that which is regulated by the number of *windows*.

At the time of the original impoſition of the houſe tax, it ſeems to have been conſidered difficult or impoſſible to aſcertain and follow the fluctuations of the rent. Some obvious and undeniable circumſtance, connected with the very form and conſtruction of the houſe, was therefore ſelected. The moſt ancient is the number of hearths. Hearth money is a very ancient duty, and ſeems to have exiſted even before the Conqueſt. Under Charles II. a tax of two ſhillings on all hearths was granted to the crown for ever. This tax was grievous to the people, on account of the domiciliary viſits to which it neceſſarily ſubjects them. It had beſides the worſt kind of inequality, preſſing harder on the poor than the rich. A man of 20l. a-year may have two hearths; a man of 200l. not above four or five. A man of 1000l. will ſcarcely have ten. Hearth money, therefore, was aboliſhed at the Revolution. In its ſtead was afterwards ſubſtituted the window tax, which could be aſcertained without entering the houſe of the contributor. It was ſoon found, however, to be liable to the ſame inequality as hearth money. In conſideration of this, the rate was greatly increaſed with the increaſe of the number of windows, and houſes having leſs than ſix were entirely exempted. If, however, as would rather appear, the rent can be aſcertained in a ſatisfactory manner, it would ſeem better to lay the whole of the houſe tax upon it directly, rather than by any circuitous and doubtful mode.

There are two parts of houſe rent; the ground rent, or that which is given for the uſe of the ground on which the houſe ſtands; and the building rent, which is paid to the builder, as a remuneration for his trouble and expence. The ground rent, as above obſerved, muſt pay a ſhare of the tax; but the building rent cannot be affected by it. The builder muſt have his profit, otherwiſe he would turn his capital and induſtry in another direction. This rule, however, is ſomewhat modified by the very durable nature of the ſubject. When the tax is firſt impoſed, it is very probable that the ſupply of houſes may continue for ſome time nearly adequate to the demand; in which caſe the proprietor muſt lower his price in order to get his houſes let. As the old houſes decay, however, new ones are wanted, which will not be built without an adequate remuneration; and thus the general law will again operate.

Income Tax.—The object of all the different aſſeſſed taxes is to make the ſubject contribute an equitable proportion of his income to the expences of the ſtate. But thoſe which we have above enumerated, though they may procure an approximation to this point, can never attain it with perfect preciſion. If therefore an income tax, eſtabliſhed on juſt principles, could be collected without any farther grievances, than the always unavoidable payment of the contribution, it would certainly be the moſt equitable aſſeſſment of any, and might with propriety ſuperſede all other taxes of this deſcription. Serious, however, are the difficulties which attend it. The correctneſs of the eſtimate muſt always depend, in a great meaſure, on the honour of the contributors; but all men are not honeſt; and the cheating of the king, is, according to the popular code, ſo venial an offence, that accurate returns cannot, in all caſes, be expected. If, on the other hand, the collectors, as in the French *taille*, take upon themſelves to farm this eſtimate, a door is opened to arbitrary and oppreſſive exactions. The impoſſibility alſo of eſcaping the tax by any ſpecies of privation makes its weight more ſenſibly felt, than in thoſe which are in any degree voluntary. For all theſe reaſons, an income tax has hitherto been among the laſt reſources to which a nation has had recourſe in its extremeſt neceſſity.

Moſt of the capitation taxes, as formerly obſerved, partook more or leſs of the nature of the income tax. The ſubſidies, ſo frequent in our early finance, were, like the *taille*, compoſed, partly according to rank, and partly according to fortune. Among the nobility, alienation of eſtates was yet rare, and the diſproportion between rank and wealth, much greater than in ſubſequent times. The eſtimate of income ſeems to have been made by the collectors. Such impoſitions, however, were ill brooked by a free and turbulent people; the ſubſidies became more and more unproductive; and at laſt were entirely given up. The firſt was impoſed under Richard II. in 1370; the laſt under Charles II. in 1673.

In ſome ſmall republican ſtates, a tax of this kind is levied, the amount of which is entirely regulated by the good faith of the contributor. At Hamburgh every citizen is ſaid to have placed in the public coffers a ſum, which is declared upon oath to be one fourth per cent. of his whole property, which, reckoning intereſt at five per cent. would be one twentieth of his income. It was not ſuppoſed that this mode of collection gave occaſion to any fraud. The good faith of the people and their confidence in their government, ſupplied the place of compulſory laws. The ſecrecy was conſidered neceſſary by a mercantile ſtate; but in ſome of the ſmall Swiſs republics, every citizen declared publicly upon oath the amount of his income, and was aſſeſſed accordingly. Such unſuſpected good faith could only exiſt in theſe ſmall ſtates, where patriotiſm was ardent, and the confidence of the people in their government entire.

Since the diſcontinuance of ſubſidies, nothing of this kind had been attempted in Britain, till the year 179 , when the accumulating weight of public debt ſuggeſted to Mr Pitt the neceſſity of raiſing a large portion of the ſupplies within the year. For this purpoſe, there appeared a neceſſity for having recourſe to an income tax; and ſo ſtrong a ſenſe was entertained by the nation of the preſſing nature of the exigency, that it was ſubmitted to with leſs reluctance than might have been expected.

An attempt was at firſt made to connect this impoſition with the former aſſeſſed taxes. Theſe were to be tripled; but if any perſon was able to prove, that this charge amounted to more than a tenth of his income, he was relieved from all which exceeded that proportion. At the ſame time, a voluntary ſubſcription was opened;

Taxation.

opened; but the produce, though honourable to national patriotiſm, afforded but a ſlender ſupply to public wants. Theſe irregular and uncertain approximations towards an income tax were ſoon given up, and their place ſupplied by the tax itſelf, in its own ſhape.

To obviate the inconveniences of diſcloſure or arbitrary aſſeſſment, meaſures have been adopted, as effectual probably as any that could be deviſed. The commiſſioners of income tax are choſen by the freeholders of the county, or by the electors in a borough, in the ſame manner as a member of parliament, excepting that a ſmaller qualification is requiſite. To the office of theſe commiſſioners, public opinion attaches a certain dignity, which makes it be performed gratuitouſly, and by the moſt diſtinguiſhed perſons in the diſtrict. Theſe are, by oath, bound to ſecrecy. The ſtatements are given, in the firſt inſtance, by the contributor; but if the commiſſioners are not ſatisfied with his return, they can require from him ſatisfactory explanations. According to the ſources of income, the perſon is aſſeſſed at the amount of one year, or at an average of three years. The reſult of theſe regulations ſeems to have been ſuch as to obviate, almoſt entirely, the chief inconveniences attached to this mode of taxation. The ſimple payment of the income tax indeed, is moſt grievouſly complained of; but the acceſſories of diſcloſure, or arbitrary aſſeſſment, which were conſidered as preſenting unſurmountable obſtacles to this meaſure, ſcarcely ſeem to be complained of at all.

The moſt important conſideration in ſuch a tax relates to the proportion in which it ſhould be paid by the different members of the community. That the loweſt orders, who ſubſiſt by the labour of their hands, ought to be exempted, ſeems univerſally agreed. This would produce the ſame effect as a tax upon the neceſſaries of life, the effects of which we ſhall diſcuſs hereafter. But independent of this claſs, an equal impoſition upon the higher and middling claſſes of the community would be extreme inequality. The larger the income, the leſs of it muſt be ſpent upon neceſſaries or common conveniences, and the more upon objects of mere ſhow and oſtentation. Theſe laſt can certainly admit more eaſily of retrenchment; and as the opulent have a greater ſtake in the country, it ſeems reaſonable that they ſhould contribute ſomewhat more in a ſeaſon of public exigency. A gradation continually augmenting, ſuch as takes place in moſt of the other aſſeſſed taxes, ſeems to be ſtrongly called for in this. The full proportion of ten per cent. was, from the firſt, impoſed upon incomes of 200l. a-year, and though this was infinitely too low, yet at a ſubſequent period (in 1806) it was brought down to 150l. This ſum, according to the preſent rate of expence, is the very loweſt at which any family in the middling rank can poſſibly be ſupported. The whole of this claſs, therefore, a claſs which has ſo many claims to the favour of the legiſlature, is aſſeſſed to the very ſame amount as the higheſt claſſes. The firſt conveniences of life are taxed at the ſame rate as its moſt ſuperfluous luxuries. Certainly 1000l. a-year ought to be the firſt income liable to the very heavy charge of 10 per cent.; and the deficiency hence ariſing might be very fairly ſupplied by an increaſe, gradually augmenting, upon incomes above that amount. Fifteen per cent. perhaps, ought to be the utmoſt that it ever roſe to; but this charge might doubtleſs be more eaſily ſupported by an income of 10,000l. a-year, than half of it by one of 200l. or 300l.

Modifications ought alſo to take place, according to the ſource from which the income is derived. That which ariſes from capital is undoubtedly of greater value than mere profeſſional income. It does not expire with its poſſeſſor; it relieves him from the care and anxiety of laying up a proviſion for his family, and allows him to ſpend his whole income, when, to another perſon, it would be the moſt culpable imprudence. Of all ſpecies of capital, land ſeems to be the moſt valuable and durable. It ſtands alſo moſt in need of the protection of the ſtate. It generally, too, comes to its poſſeſſor by inheritance, and is not the fruit of his own induſtry. With regard to money, although its value is ſtill much ſuperior to ſalaries or profeſſional profits, yet it ſeems rather to be the policy of government to favour its accumulation, which a very great addition of charge might diſcourage. Money beſides is a more moveable ſpecies of property than land, or even than profeſſional income. If heavily taxed, the proprietor might withdraw into another country, and his capital, with the induſtry which it ſupported, be thus loſt to the community.

The preſent tax makes no diſtinction between income which dies with its poſſeſſor, and income ariſing from land or capital. Yet ſuch a diſtinction, if it appeared eligible, might eaſily be made under the preſent ſyſtem of collection, which demands a ſtatement, not only of the amount of income, but of the ſource from which it ariſes. The propriety, however, of ſuch a charge demands ſome conſideration. Land, it is true, is well able to bear a conſiderable ſhare of the public burthens. But land, in this country, and in almoſt every other, is the ſubject of a peculiar tax, over and above what is paid by income ariſing from other ſources. If therefore it were alſo to pay a greater proportion of the income tax, the preſſure might become unjuſtly ſevere. The land tax in this country amounts to about two millions. Were we to ſuppoſe the ſhare of the income paid by land to amount to 5,000,000l. (a large allowance), land would then pay fourteen per cent. which ſeems as much as can reaſonably be exacted. No ſuch burden, at leaſt in any ſenſible degree, falls upon ſtock; but for the reaſons above ſtated, the propriety of taxing it heavily ſeems ſomewhat equivocal.

According to the original bill, as propoſed by Mr Pitt, very liberal exemptions were granted on account of children. To encourage marriage and the rearing of families, has been generally conſidered by legiſlators as an important object. From ſome recent ſpeculations, however, it has appeared doubtful whether it be deſirable to remove the obſtacles to marriage which ariſe from the difficulty of ſubſiſtence. Whether from theſe views, or from the mere wiſh of rendering the tax more productive, this exemption has been gradually circumſcribed. The laſt regulation made reſpecting it ſeems to be of a very capricious nature. An allowance of four per cent. is given, but only for the number of children exceeding two. This allowance beſides is given, not out of the income tax itſelf, but out of the aſſeſſed taxes. It is difficult to conceive any motive for this laſt regulation; and, eſpecially in the caſe of the middling claſſes, it may ſometimes render the exemption nugatory.

Other Aſſeſſed Taxes.—A conſiderable revenue is raiſed in

Taxation.

in this country by taxes on men ſervants, pleaſure horſes, carriages, dogs, &c. Theſe are all luxuries, the uſe of which is confined to the moſt opulent claſſes; they form, therefore, extremely proper ſubjects of taxation. The income tax indeed, modified as above ſtated, might perhaps come inſtead of all ſuch taxes; but while that tax favours the higher above the middling claſſes, theſe in queſtion tend to remedy that inequality. One aſſeſſment, however, is of a different nature; that upon labouring horſes. It is not likely, and certainly could never be intended, that this tax ſhould reſtrain the uſe of theſe indiſpenſable inſtruments of agriculture. Neither can the duty fall upon the farmer, who, in all caſes, muſt have his profits. To ſecure this, he muſt pay the leſs rent, in proportion as he pays the more tax; and this duty will finally operate as a land tax. It does not ſeem, however, to have any advantages above a direct aſſeſſment of the ſame nature. It will bear hard upon the farmer who is in the middle of his leaſe at the time of its being impoſed. If at all heavy, it may have ſome tendency to limit the uſe of ſuch horſes, and to encourage inferior ſubſtitutes. The tax was firſt laid at 2s. and was juſtified only by its extreme lightneſs. It was then gradually raiſed to 14s.; but a propoſal to raiſe it ſtill higher was thrown out by parliament, and has never been again revived.

2. *Taxes upon Commodities.*—The experience of the diſcontent excited by direct aſſeſſments, and of the difficulty of proportioning them equally, led to the impoſition of taxes on conſumable commodities. Theſe being laid in the firſt inſtance on the commodity at the time of its production or importation, are finally paid by the conſumer in the increaſed price of his goods. No taxes are ſo little felt, or excite ſo little diſcontent. The duty, mingling with the price of the goods, is confounded with it; and unleſs when the tax is firſt impoſed, and a ſudden riſe in conſequence takes place, the great maſs of the people are even ignorant, how much of what they pay goes to government, and how much conſtitutes the mere price of the goods. The payment is alſo made in the moſt convenient manner, and may be divided into the ſmalleſt portions. The power of not paying by ceaſing to conſume the article taxed, goes a great way in ſuppreſſing murmurs. Thus, indeed, thoſe whoſe expence does not keep pace with their fortunes, pay an unequal ſhare of the common contribution. But as the law is generally diſpoſed to recommend economy, it will not perhaps conſider this as a ſerious objection.

For theſe reaſons, the modern ſyſtem of finance, particularly in this country where it is ſo much an object to avoid diſcontent, has ſhewn a decided favour to this mode of raiſing a revenue. And perhaps, upon the whole, they are the beſt of any; yet the evils with which they are attended are by no means inconſiderable.

1. Theſe taxes take more out of the pocket of the people, in proportion to what they put in that of the public, than any other. This ariſes from the extenſive and minute ſuperintendence which is neceſſary for their proper collection. For this purpoſe, a number of officers muſt be kept, whoſe ſalaries form a ſerious deduction from the produce. In Smith's time, this expence amounted to above $5\frac{1}{2}$ per cent. on the duties of exciſe, and above 10 per cent. on thoſe of cuſtoms. The great augmentation of revenue which has taken place ſince that time, has been produced more by an increaſe of duty on articles formerly taxed, than by the introduction of new ſubjects of taxation. The expence of collection, however, bears ſtill a larger proportion to the amount collected, than either in the ſtamps or aſſeſſed taxes.

There is another way, in which the burden of theſe taxes is rendered heavier on the public. The merchant or producer advances the tax, often a conſiderable time before he can diſpoſe of the article. He muſt therefore have not only indemnification to the amount of the duty, but alſo profit on the advance which he has made. It is univerſally obſerved, that when a new tax is impoſed, the article riſes more than in proportion to it. The public commonly murmur, and complain that the merchant has merely made the tax a pretence for this diſproportionate increaſe in the price of his article. The truth is, however, that the merchant has a reaſonable claim to receive the ſame profit on that part of his capital, which he has employed in advancing the tax, as upon that which he employed in the original purchaſe of the commodity.

2. Though the collection of theſe taxes is leſs grievous to the great maſs of the people, yet it falls heavier on certain claſſes. Theſe are the dealers in exciſeable commodities. As evaſion is much eaſier here than in aſſeſſed taxes, a more grinding ſyſtem of ſuperintendance becomes requiſite. The tax-gatherer muſt have continual acceſs to every part, not only of the workſhop, but even of the private houſe, of the dealer in them. No time, no place, can be exempt from his viſits. The power with which he is inveſted may alſo, if he be ſo diſpoſed, give occaſion to inſolence at leaſt, if not to oppreſſion. Now, as the dealers in theſe commodities form a part, and even a pretty numerous part of the ſociety, any hardſhip falling upon them muſt be a conſiderable evil. It is felt, beſides, though not directly, by the reſt of the ſociety. It has already been obſerved, under the head of POLITICAL ECONOMY, that every diſagreeable circumſtance attendant on any profeſſion, neceſſarily raiſes the rate of wages and profit in that profeſſion. It cannot be ſuppoſed, that the dealers in theſe commodities will ſubmit to the hardſhips we have noticed, without claiming ſome indemnification in the price of their goods. Thus the firſt inconvenience will be augmented, and ſtill more will be taken from the people, without any addition to the revenue of the public.

3. Theſe taxes give birth to the trade of ſmuggling, a trade at once injurious to the public, and ruinous to the individual. Unfortunately the lax ſtate of public morals, in regard to this point, offers a ſtrong temptation to graſp at the extraordinary profits which ſmuggling affords; and from the ſame cauſe, the produce of ſuch traffic, when ſucceſsful, is always ſure of a ready ſale. This trade, however, in the end, generally ruins not only the fortune, but alſo the morals of him by whom it is purſued. It trains to the practice of falſehood, perjury, and other vices, without which it cannot be carried on with any chance of ſucceſs.

4. Such taxes always alter more or leſs, the natural, and conſequently the moſt advantageous direction of national induſtry. The tax upon wine muſt diminiſh the conſumption of that article, and conſequently the induſtry

duſtry employed in producing it. Wine indeed is not a commodity of Britiſh production; but it muſt be purchaſed with Britiſh commodities, and if the merchant cannot import it, neither can he afford a market for theſe Britiſh articles which were to be given in exchange for it. Dr Smith ſeems to imagine, that theſe taxes produce an abſolute defalcation in the amount of national produce; a ſuppoſition in which we are inclined to differ from him. Although there is a diminution in the demand for this particular article; yet as the ſum levied is not withdrawn from the national expenditure, but is merely transferred from one claſs of perſons to another, it muſt ſtill ſupport a demand, if not for the ſame, at leaſt for ſome other ſpecies of commodities. Thus the public will ſuffer chiefly from the inconveniences attendant on the change. Other reſtraints, however, for which there is no ſuch compenſation, are neceſſarily attendant on the collection of ſuch duties. In order to render this efficacious, regulations muſt often be made, as to the manner in which the trade is to be carried on; and it is always to be apprehended, that governments will be more attentive to the ſecurity of the revenue, than to the eaſe of the public. In arbitrary and unenlightened governments, this propenſity becomes often ſo powerful, as to throw the moſt formidable obſtacles in the way of that free circulation of commodities on which the proſperity of trade, and of all induſtry, eſſentially depends.

The commodities on which theſe duties are impoſed, may be either the neceſſaries or the luxuries of life. Between theſe two diviſions the line is not eaſily drawn. Neceſſaries, ſtrictly ſpeaking, are confined to thoſe things, without which life cannot be ſupported or health preſerved. Yet, though the philoſopher may reaſon thus, the ſovereign cannot confine his people within ſuch ſtrict limits. In regard to food indeed, which is entirely a domeſtic arrangement, this definition may hold; but in clothing and lodging, the arrangements of which are in the eye of the public, long cuſtom may impoſe obligations of decency and propriety, which fall little ſhort of abſolute neceſſity. Every thing, in this reſpect, muſt be conſidered as neceſſary, which a common labouring perſon of the loweſt claſs cannot want, without incurring the reproach, or exciting the commiſeration, of others in the ſame ſtation.

Taxes upon the neceſſaries of life have the ſame effect with taxes upon the wages of labour. Dr Smith, and moſt other writers, ſeem to conceive that the immediate effect of ſuch taxes is to raiſe the wages of labour. But we do not ſee that ſuch can be the caſe. Nothing can raiſe the wages of labour, except an augmentation of the funds deſtined for its ſupport. But theſe funds, far from being raiſed by ſuch taxes, are ſomewhat diminiſhed. The employers of the poor, being themſelves affected by them, will be leſs able to pay wages than before. It is quite a fallacy to urge, that the labourer, if he does not get ſufficient wages, will refuſe to work. This might be, if the tax affected only a certain claſs of labourers, and left the reſt free. The labourer, if he could not, over and above the tax, obtain the regular ſtandard rate, would withdraw to other employments. The conſequence would be, a riſe in the wages of the taxed labour, with a ſlight fall in thoſe of every other, proportioned to the additional number who would thus be thrown upon it. But where the tax falls equally upon labour of every deſcription, as taxes upon the neceſſaries of life muſt do, there is no new quarter to which the labourer can turn; there is nothing either to raiſe or to lower wages; the ſupply of and demand for labour continue the ſame. The effect of the tax is merely to diminiſh the ſubſiſtence of the labourer in proportion to its amount.

This, however, is merely the firſt effect; for the diminiſhed ſubſiſtence will ſoon begin to act upon the population, which furniſhes the ſupply of labour. Were wages at the time ſo low as to furniſh merely the neceſſaries of life according to the firſt definition, that is, ſuch neceſſaries as it could not ſubſiſt without, the inevitable conſequence ſeems to be, that part of the labouring poor muſt periſh for want. Such a calamitous effect ſeems actually to reſult, in the crowded population of ſome eaſtern empires, when a deficient crop produces a ſcarcity of ſubſiſtence. Happily, however, the labouring poor are ſeldom ſo wholly without reſource. In general the wages are ſufficient to allow them a portion of the other deſcription of neceſſaries, and even of luxuries, by retrenching which, they can, in the event of ſuch a tax, preſerve themſelves from abſolute ſtarvation. In the end, however, the diſcouragement to marriage, and difficulty of rearing children, will reduce the population. This reduction, diminiſhing the ſupply of labour, will increaſe wages, till they cover the amount of the tax. The ſame ſum, divided among a ſmaller number will make more to each.

High wages operate as a complete tax upon every ſpecies of manufactured produce. The manufacturer muſt charge upon the price of his goods the whole ſum which he has paid to his workmen with a profit. In the market of the world, therefore, he muſt, *ceteris paribus*, be underſold by the manufacturer who reſides in a country where labour is cheaper. When theſe high prices however, are the reſult of national proſperity, when they improve the ſubſiſtence of the labourer, and lay a foundation for increaſed population, this diſadvantage will weigh very light in the balance. But where they are the reſult of diminiſhed population, and attended with no improvement in the condition of the labouring poor, they form one of the greateſt evils with which a nation can be afflicted.

For theſe reaſons, taxes upon the neceſſaries of life, though certainly productive, have always been found to be oppreſſive and ruinous to the proſperity of a ſtate. Luxuries, therefore, form the proper objects of taxation. As every one, if unable to purchaſe his uſual quantity, can either diminiſh it or abſtain altogether, the riſe of the article has no tendency to induce ſuch a degree of want, as to check population, and thus cauſe a riſe to the wages of labour. This power of abſtinence may indeed lead to a certain inequality; but as this inequality is altogether voluntary, it can neither excite murmuring, nor be conſidered as a ſerious hardſhip. The greateſt irregularity is in the caſe of abſentees, by whom ſuch taxes are evaded altogether.

It is not, however, we muſt obſerve, from the mere luxuries of ſhew and oſtentation that any important or permanent revenue is to be drawn. Theſe are confined chiefly to perſons of large fortune, who are few in number, and are always ſubject to the influence of faſhion, ſo that little dependence can be placed on their regular conſumption. The luxuries from which alone a great

Taxation. revenue can be drawn are those which, among the higher and middling classes, have come to be considered almost as necessaries, and which are extensively used by such as are in easy circumstances, even among the lower orders. The only drink necessary for supporting the human constitution in perfect health, seems to be pure water. Men, however, have an universal propensity for something more, both to gratify their taste, and to exhilarate their spirits. Fermented and spirituous liquors, tea, coffee, &c. are had recourse to with this view, and are habitually used in various forms and degrees, by almost every inhabitant of this country. Such articles form therefore the grand basis of this system of taxation.

Of all superfluities, tea seems to be one of the greatest. It affords neither nourishment nor strength, and is generally considered by physicians as injurious to the human constitution. Being imported besides from a remote country, the intercourse with which was, by the mercantile system, stigmatized as injurious, it was considered as every way a fair subject of taxation. Very high duties were accordingly accumulated upon it, which, in 1783 amounted to nearly 30 per cent. on the value, besides an excise of 1 s. on every pound. It was found that so high a duty opened a wide door to the smuggling of a commodity of so small bulk, and which was then imported in large quantities by all the neighbouring countries. It was calculated, that though duty was paid on five or six millions of pounds, the consumption of Great Britain amounted to more than double that quantity. A plan was therefore brought forward by Mr Pitt to substitute in its room an additional tax on windows. Smuggling was no doubt checked, and the people were, on the whole, gainers; yet the new tax, being assessed, was more heavily felt by the public than its predecessor, which was only a duty on consumption. Since that time, the exigency of the times has made it again necessary to have recourse to this article; and the tax upon tea has been raised even higher than it was previous to the commutation tax. The diminution, however, of the Indian trade carried on by the other powers, joined to the stricter precautions against smuggling, has prevented its renewal to nearly the same extent as formerly. Tobacco is a still more complete superfluity than tea, yet its use is very extensive. It has therefore been justly considered as one of the propereſt of all subjects of taxation, and duties have been laid upon it, amounting to five or six times the original value of the article.

Wine is the wholesomest of all fermented liquors, and is even pretty extensively used as a medicine. These circumstances might seem to entitle it to some favour, which, however, it has not experienced. Being entirely a foreign commodity, and being particularly cultivated by a nation long the object of our commercial jealousy, it has incurred the decided hostility of the mercantile system. Duties have been imposed, considerably exceeding the original value. A preference has also been shewn to the wines of Portugal and Spain, (though inferior in quality), which has rendered them the common drink of this country.

Spirits are an article extensively consumed in this country, and on which a high duty may, with the greatest propriety, be imposed, for the purposes not only of revenue, but of moral regulation. They afford no nourishment, and are in the highest degree liable to abuse. They are affected by the general tax on malt; but pay, besides, a considerable one when manufactured. In order to obviate the smuggling which was carried to a great extent in the making of spirits, it has been found advisable to lay the duty on the still, in proportion to its contents. It is paid by the month; and the distiller, when he chooses at any time to intermit his operations for that period, may, by giving due notice to the officers of revenue, avoid being charged. When this plan was first adopted, the duty was comparatively very low. But Mr Pitt soon found himself completely deceived as to the productiveness of this rate of duty. It was raised therefore successively to 162l. its present rate. This system lays the distiller under a temptation to work very rapidly, which is supposed to be injurious to the quality of the spirits. It obliges them also to work without intermission, which they did at first without even the exception of Sunday, till that practice was prohibited by the legislature. It may be proper to notice, that this mode of imposition is confined to Scotland, and that in England it is laid upon the wort or wash.

Fermented liquors from malt are much more useful. They are the most nutritive perhaps of any species of drink, and are on that account well suited to those who are engaged in hard labour. Neither do they offer the same temptations to excess; yet their extensive use, and the necessity of raising a revenue, have led the legislature to consider them as a staple subject of taxation, and they are now charged with a duty of nearly 100 per cent. Dr Smith advises the transference of the whole tax on beer to the malt tax. The latter appears to be less liable to smuggling, and it obviates the present exemption enjoyed by private brewers, which is evidently unreasonable and unequal. The only objection seems to be, that, being imposed at an earlier period of the manufacture, it obliges the manufacturer to lie longer out of his advance, and consequently to demand a greater profit; though this might perhaps be obviated by allowing him a longer credit. The additional taxes, however, imposed upon this article, have been all laid upon beer or porter. In general, it would appear that considerable unnecessary trouble is occasioned by taxing successively different stages of a manufacture. By laying the whole either upon malt, or upon beer, a considerable expence of collection might be saved, without any diminution of the produce.

There are many species of food which cannot, strictly speaking, be considered as necessaries of life, since their place can be supplied by some less expensive substitute. Butcher meat can be supplied by eggs, butter, and other products of milk; wheaten bread by other bread of inferior grains. It may be observed, however, that the imposition of a tax on the superior article would produce an increased demand for the inferior; and consequently raise its price. Accordingly, both butcher meat and wheaten bread are universally numbered among the necessaries of life; nor do we recollect, in the British system of taxation, any instance of solid food liable to duty. This is not the case in other countries, particularly in Holland. Heavy taxes are there imposed upon both articles. All butcher meat pays a duty of more than 7 per cent. of its value. All cattle, besides, pay about 5s. per annum. The tax upon ground corn is also very heavy and undistinguishing. Wheat pays

Taxation.

pays 104 florins (nearly 9l.) per last. Nor are the inferior grains entirely exempted. Rye pays 42 florins (about 3l. 10s.); barley, beans, and oats, about 2l. Smith is not disposed to censure these heavy impositions, as they may have been rendered necessary by the long wars in which this people were engaged for the support of their independence; and when proper subjects of taxation are exhausted, recourse must be had to improper ones. Upon examining the list, however, of Dutch taxes, we do not find that the taxes upon articles of luxury are so very high, as to have reduced the legislators of that country to such an extremity. The excise upon the *aam* of wine, equal to 40 English gallons, is only 14 florins, or about 1l. 5s. Tobacco, so fair an article of taxation, and so much used in Holland, is taxed only by a slight licence, estimated at little more than a halfpenny a pound. Beer and spirits are taxed still more moderately than wine. Besides, even supposing all the articles of luxury to be exhausted, we should conceive it more advisable to have recourse to assessments upon income to the necessary extent, than to duties upon articles of necessity. Accordingly, in this country, a larger revenue in proportion to the population, is now raised than ever was raised in Holland, without having recourse to these ruinous resources.

Clothes and furniture are, to a certain extent, as much necessaries of life as food. The quantity of them, however, which comes under this description, is much less; by far the greater part of the expence which is laid out in this way being for the purpose of convenience at most, if not of mere shew and ostentation. There seems therefore no reason for sparing any, beyond those plainest articles which decency demands from the lowest of the people. This class of commodities, however, has met with peculiar indulgence, in consequence of the favour entertained by the mercantile system for manufactures of every kind. Woollens and hardwares, the two staples of England, have been completely exempted. The same favour has been shewn to linen, the staple of the sister kingdoms. Yet, provided a corresponding drawback were allowed on exportation, there does not appear any good reason why the finer sorts of all these fabrics should not be made a subject of revenue. Printed linens and cottons, which have recently been so abundantly produced both in England and Scotland, have been made to pay a considerable tax.

But though the legislature of this country has been thus laudably attentive to avoid touching on the first necessaries of life, there are still several particulars in which it has failed. One of the most important of these is coal, an article of the first utility, the universal fuel of this country, and the material of many of its most important manufactures. It is the less able to bear any duty, because from its local and bulky nature, the expence of transport is often very heavy. London is supplied with coal from Newcastle, which is 300 miles distant. If a bounty could in any case be advisable, it would be in such a case. The legislature, however, has judged otherwise, and has imposed upon every ton of sea-borne coal, a duty of 3s. 6d. Coals carried by land or inland navigation are duty free. Through the exertion of Lord Melville, Scotland, to the north of St Abb's Head, has been freed from this duty; a circumstance which has materially contributed to her rapid prosperity.

Salt, though it may not be requisite for the support of life, has yet, by immemorial usage among civilized nations, been constituted a necessary of life. Notwithstanding this, the small quantity used by each individual, and the minute portions in which it is purchased, make a tax upon it be levied with less murmuring than most other taxes. Governments, taking advantage of this circumstance, have almost universally made it a source of revenue.

In this country the tax on this article presses with the greater severity, as salt is essential to the fishery, one of the most important sources of national wealth. It is true, the duty is drawn back, when salt is so employed; but the facility of smuggling by means of this drawback, produces the necessity of strict regulations, which cramp extremely this branch of industry, especially when carried on in that small scale which is peculiarly suited to it.

Leather, soap, and candles, are also necessaries of life taxed in this country. But though these articles are to a certain extent necessary, by far the greatest consumption of them is for purposes of luxury. Although therefore these taxes do press upon the poor, their weight is not very severe. It might seem easy enough, at least in the first and last of them, to exempt those coarser forms of the commodity, which are used by the lower classes, and thus the deficiency of revenue might be compensated by an increase on the more expensive forms.

Taxes may be imposed either upon exportation or importation. The duties of customs were at first levied on both indiscriminately; but as the mercantile system gained ground, and an anxious desire prevailed to encourage exportation and check importation, in the hope of increasing the specie in the country, all the new duties were laid upon the latter, while the former was more and more exempted. Although this system may not have taken its rise from the most enlightened views, yet no reasonable exception can be taken to it. The taxes imposed by any government ought to fall upon the consumption of its own people, not upon that of others; and as this is a maxim of justice, so it is equally recommended by policy. Were a government to tax its own exported commodities, these commodities would also have to pay the taxes of the country into which they were imported. Loaded with this double burden, they could not advantageously come into competition with similar articles, either the produce of that country, or imported from another which followed a more liberal policy. It is only therefore upon goods imported or produced for home consumption, that these taxes can with propriety fall. From similar views, the materials of manufacture have been generally exempted from duty. We have already observed, that, provided these manufactures be objects of luxury, there is no good reason why they should not pay a tax. But there is an evident advantage in levying the duty *after*, rather than *before*, the manufacturing process. In the latter case, the merchant, being obliged to advance it so early, must have a profit on his advance, proportioned to the length of time which elapses till the commodity is fit for sale; and this profit must be paid by the consumer in the price of the goods.

Should we suppose indeed a nation to possess a monopoly of any particular commodity, such a nation might impose

Taxation.

impoſe a tax on its export, without danger of its merchants being ſupplanted in the foreign market. Still this could not but be conſidered as a ſomewhat illiberal ſyſtem; and it would alſo bear hard upon the producer, who would ſtill probably have a double ſyſtem of duties to pay, ſince it cannot be ſuppoſed that the foreign country ſhould regard theſe monopolized commodities with peculiar favour.

With the view of following up the principles of the mercantile ſyſtem, importation duties have often been laid upon goods, ſo heavy as to amount to a prohibition. Such duties are not intended to produce any revenue, but to favour ſome home manufacture, or to injure that of ſome foreign nation, which is an object of commercial jealouſy. In the ſame manner, bounties are given to forward the growth of ſome branch of induſtry, which is the object of peculiar favour. In both caſes, the revenue is ſacrificed, without any real advantage accruing to the public. The induſtry and capital of the nation are thus turned from their natural direction into one which is leſs advantageous, and the public is injured inſtead of being benefited.

It is an undoubted principle, that whether the tax be paid at the time of importation, or at manufacture, it ought to be paid only once. Some governments, profoundly ignorant of the true principles of political economy, have repeated the impoſition at every ſucceſſive ſale of the property. This is obviouſly unequal. The value of property, and the frequency of its transference, are two things altogether diſtinct. One ſpecies of goods may thus come to pay ten or twelve times as much as another of the ſame value. But great as is its inequality, its impolicy is ſtill more glaring. It forms the moſt powerful check to that free interchange of commodities which is the very ſoul of all induſtry. It tends to confine the conſumption of every article to the place of its production, and thus to exclude all thoſe benefits which ariſe from the extenſion of the market. Of this ruinous nature is the Spaniſh *alcavala*, which conſiſts in an impoſition, originally of 10, but now only of 6 per cent. on every ſale without exception, whatever be the nature of the property, or however frequently repeated. The mere undiſtinguiſhing nature of ſuch a tax muſt be a great evil; but it is rendered far more pernicious by the obſtruction which it thus throws in the way of every ſpecies of commercial intercourſe.

It may be eſtabliſhed as a principle in regard to theſe taxes, that they ought to be as uniform as poſſible, and not to vary in different parts of the country. Such variations neceſſarily lead to reſtraints on the free circulation of commodities. Each province becomes as an independent kingdom, the frontier of which is guarded by cuſtomhouſes and by chains of officers, through which whoever paſſes muſt ſubmit not only to the payment of duties, but to the inconvenience and delay of having his goods ſearched. Such was the caſe both in France and in Spain, where each province having formerly been ſeparate and independent, retained ſtill its diſtinct ſyſtem of taxation. The tranſporting of goods from one province to another was like exporting them to a foreign country; the ſame barriers of cuſtomhouſes, duties, and revenue officers, obſtructed their paſſage. One of the circumſtances which has moſt contributed to the proſperity of Great Britain is the uniformity of taxation throughout, and conſequently the entire freedom of commerce from one part of the iſland to the other. This was the principal advantage which Scotland derived from the union; and it has been ſuch as fully to compenſate for the increaſed burdens to which that meaſure ſubjected her.

Duties upon conſumption, inſtead of being levied upon the trader, may be levied upon the perſon conſuming, who may be made to pay a certain ſum as a *licence* to uſe the commodity. Such a mode of levy has ſome of the advantages of aſſeſſed taxes, in regard to the facility and cheapneſs of collection. It is ſtill alſo in ſome degree ſpontaneous; but it muſt obviouſly be, in moſt caſes, very unequal. Of two perſons, who ſhould pay the ſame ſum for a licence to uſe wine, one might conſume twenty times the quantity of the other. A licence has beſides the diſadvantage of being paid all at once, and of being more ſenſibly felt than taxes which confound themſelves with the price of the commodity. In general, therefore, it is a much leſs eligible form. There are a few inſtances, however, of very coſtly and durable goods, ſuch as coaches, plate, &c. where it is found to be the moſt convenient. Wine and other liquors, when conſumed in taverns, may, it is ſuppoſed, be fairly required to pay more than when conſumed in private houſes. An attempt, however, to proportion this addition to the quantity conſumed, would be attended with unſurmountable difficulties. A licence is therefore required to be taken out by innkeepers who deal in theſe articles. This tax falls with equal weight upon the great and ſmall dealers; but it may be rather conſidered as deſirable to check the multiplication of the laſt.

3. *Stamp Duties.*—Under the title of ſtamp duties, we would include all thoſe which fall upon the deeds which regulate the transference of property.

The firſt of theſe duties, of which we find any mention, are thoſe upon teſtamentary donations. A law of Auguſtus impoſed the *viceſima hereditatum*, or twentieth penny, upon all inheritances. It was in Holland, however, which was preſſed by the ſevereſt neceſſity of raiſing a revenue, and not very diſcriminating in the mode of doing it, that the ſyſtem of *ſtamp* duties firſt originated, and was carried to a formidable extent. Such were the difficulties of that ſtate, that they are ſaid to have publicly propoſed a reward to any one who ſhould ſuggeſt a new ſource of revenue. This plan was propoſed and approved. From Holland it was, in 1671, imported into this country, and has ſince become one of the great ſources of public income. In other countries, deeds regarding the transference of property are required to be entered in a public regiſter, and the tax laid on the regiſtration. A conſiderable revenue was thus raiſed in France. Auction duties upon the ſale of property, both moveable and immoveable, though ſomewhat different in point of form, coincide exactly with theſe taxes in their eſſence and tendency.

Taxes of this nature are attended with conſiderable conveniencies to the contributors. From the nature o the tranſaction, there muſt always be money in hand with which the tax can be paid; and the time of payment is thus the moſt convenient of any. In many caſes, the ſum to be paid at a time is ſmall. It is only part of the ſociety which is liable to them to any great extent, and theſe only occaſionally; they are not felt as intrenching on daily and habitual comforts; nor do they

they excite that general murmur, which is alone formidable to government. It is not to be wondered at, therefore, if the latter ſhould avail themſelves of this paſſive diſpoſition in the people for the extenſion of this ſource of ſupply. The truth is, however, that in all eſſential reſpects, theſe taxes are among the moſt improper of any.

1. They are unequal, inaſmuch as the value of any property is altogether unconnected with the frequency of its transference. This inequality would ſubſiſt, even though the ſtamp duty were always in exact proportion to the value of the property. But this is, in general, far from being ſtrictly the caſe. It may be noticed, however, that in the recent additions made to the ſtamp duties in this country, the principle of equality has been more attended to.

2. The greater part of ſuch taxes fall not upon the income, but upon the capital of the country; not upon that fund which may be properly and ſafely expended, but upon that, the expenditure of which muſt be ultimately ruinous. This circumſtance is peculiar to theſe duties; for though others, when very ſevere, may oblige the contributor to encroach on his capital, they alone fall directly and immediately upon that fund. An objection of this nature would alone be ſufficient to diſſuade their adoption.

3. Such taxes, when they fall upon moveable goods, have a direct tendency to check commerce, and through it every kind of induſtry. They are then a complete *alcavala*, differing from that ruinous impoſt only by being more moderate.

Thus we find, that the facility of collection, and the avoiding of diſcontent, which have tempted modern governments to extend ſo much this ſource of revenue, are altogether fallacious advantages, and bear no proportion to the ill conſequences with which ſuch taxes are neceſſarily attended. It would therefore be much better that the duties upon the transference of moveable goods ſhould be laid upon their original production. They would thus pay only once, and no impediment would be thrown in the way of their free circulation. Duties upon the ſale of land and other immoveable goods, ought to be converted into aſſeſſed taxes, payable on their yearly uſe. In the preſent circumſtances of this country indeed, it is perhaps too much to expect that taxes, which are paid without much murmuring, ſhould be taken off; but the conſiderations now ſtated ought certainly to deter from any farther addition to them.

Legacies from any diſtant relation are a ſort of accidental and unexpected advantage, and it is therefore to be ſuppoſed, that the perſon receiving will have ſecured a regular ſource of ſubſiſtence independent of them. He will not therefore, it is likely, be diſpoſed to complain very grievouſly, if this extrinſic ſource of wealth be ſomewhat diminiſhed by a duty to government. In this country, accordingly, ſuch legacies are chargeable with a duty of 10 per cent. This tax ſeems one of the moſt unexceptionable of the kind, and only liable to the objection of falling upon capital. It is otherwiſe with money left by a father or other very near relation. The death of ſuch perſons commonly diminiſhes, inſtead of increaſing, the wealth of the family; and the ſum left forms often the ſole dependance of a great part of it. Accordingly, in Great Britain, the duty on legacies to the neareſt relations is very ſlight, and gradually increaſes as the conſanguinity becomes more remote.

Receipt ſtamps, though they are formally paid by the ſeller, fall really upon the purchaſer. The merchant, who muſt have his profit, will calculate the expence which he is likely to be at in ſtamps, and will lay a correſponding augmentation on the price of his goods. Such taxes, unleſs very heavy, will fall upon income only, not upon capital.

Bills of exchange, and policies of inſurance, being neceſſary inſtruments of trade, ſeem as improper ſubjects of taxation as can well be. The only thing tolerable in theſe taxes, as impoſed in this country, is their moderation.

Auction duties ſeem liable to every objection which can be ſtated againſt taxes of this deſcription. They are the more ſevere, as they muſt fall often upon unfortunate perſons who are reduced to the neceſſity of diſpoſing, in this manner, of their property.

Stamps upon law proceedings tend to increaſe the expence of obtaining juſtice, which is already complained of in general as too heavy. They may indeed be ſuppoſed to be of ſome uſe in checking a litigious ſpirit; but this ſeems already to be done pretty effectually by the other expences attendant on judicial proceedings.

Taxes upon indentures, or upon the entrance to any profeſſion, produce a monopoly to the perſons exerciſing that profeſſion. They thus tend at once to raiſe the price of their labour and of its fruits, and to diminiſh the neceſſity of qualifying themſelves for its performance. The chief weight of theſe taxes falls upon the perſons exerciſing the profeſſion of the law. The public are apt to regard ſuch perſons with a degree of hoſtility, which has probably induced government to believe it might tax them without danger of exciting any general murmur. The truth is, however, that theſe taxes fall not on the practitioners themſelves, but on thoſe who complain of them, on the perſons engaged in litigation; ſo that their effect is preciſely the ſame with that of taxes on law proceedings. It differs from them only as a licence differs from a duty upon commodities, and is leſs eligible, as falling more unequally. The perſons who pay the ſame ſum at entrance, carry on their profeſſion with very different degrees of ſucceſs.

Some impoſitions, which aſſume the form of ſtamp duties, are in reality taxes upon commodities. Such are the game duty, the duty on cards, hats, plate, &c. But moſt of theſe ſeem to be unexceptionable ſubjects.

TAXUS, the YEW-TREE, a genus of plants belonging to the claſs diœcia, and in the natural ſyſtem ranging under the 51ſt order, *Coniferæ*. See BOTANY *Index*.

TAY, in Latin *Tavus*, or *Taus*, the largeſt river in Scotland, riſes in Braidalbane, on the frontiers of Lorn; and having in the paſſage of a few miles augmented its ſtream by the acceſſion of ſeveral ſmall rills, ſpreads itſelf into the lake called *Loch Dochart;* out of which having run but a little ſpace, it expands itſelf again. Leaving this ſecond lake, it rolls ſome miles with a conſiderable body of water, and then diffuſes itſelf in the ſpacious Loch Tay; which, reckoning from the ſources of the river, is 24 miles in length, though, ſtrictly ſpeaking,

Tay, Taylor.

ſpeaking, the lake is but 13: almoſt as ſoon as it iſſues from hence, it receives the river Lyon, coming out of Loch Lyon, and running through Glen Lyon; which, having travelled in a manner parallel to it, from its ſource, for a ſpace of 25 miles, at length joins the Tay as it enters Athol, which it next traverſes, and, directing its courſe in a manner due eaſt, receives almoſt all the waters of that country. Bending then to the ſouth, at the diſtance of ſix miles, it reaches Dunkeld; which, in the language of our anceſtors, ſignifies "the hill of hazels," was the very centre of the old Caledonia, and is at preſent eſteemed the heart of the Highlands. The river is very broad here, inſomuch that there is a ferry-boat over it at each end of the town. Declining ſtill to the ſouth-eaſt, with a winding courſe, for above 12 miles, the Tay receives a large ſupply of waters from the county of Angus; and then running ſouth-weſt for eight miles more, is joined in that ſpace by ſeveral rivers, the moſt conſiderable of which is the Almond. Turning then to the ſouth-eaſt, at the diſtance of about three miles, this copious river comes with a ſwelling ſtream to Perth.

The Tay, continuing ſtill a ſouth-eaſt courſe, receives, a few miles below Perth, the river Erne; which, iſſuing from a loch of the ſame name, traverſes the county of Strathern, and paſſes by Abernethy, once the capital of the Pictiſh kingdom. Swelled by the waters of this laſt river, the Tay, running next directly eaſt, enlarges itſelf till it becomes about three miles broad; but contracts again before the town of Dundee; ſoon after which it opens into the German ocean. At the entrance of the frith, there are ſands both on the north and on the ſouth ſide; the former ſtyled *Goa*, the latter *Aberlay* and *Drumlan*; and before theſe, in the very mouth of the frith, thoſe which are called the *Croſs Sands*. At Buttonneſs, which is the northern promontory, there are two light-houſes. The ſpace between the north and the ſouth ſands may be near a mile, with about three fathoms water; but being within the frith, it grows deeper, and in the road of Dundee is full ſix fathoms. The frith of Tay is not indeed ſo large or ſo commodious as that of Forth, but from Buttonneſs to Perth it is not leſs than 40 miles; and the whole may be, without any great impropriety, ſtyled a harbour, which has Fife on one ſide, and the ſhires of Perth and Angus on the other, both very fertile and pleaſant countries.

TAYLOR, Dr Jeremy, biſhop of Down and Connor in Ireland, was the ſon of a barber at Cambridge, where he was educated. Upon entering into orders, he became divinity lecturer of St Paul's in London; and was, by the intereſt of Archbiſhop Laud, elected fellow of All-ſouls college, Cambridge, in 1636. Two years after he became one of the chaplains of the archbiſhop, who beſtowed on him the rectory of Uppingham in Rutlandſhire. In 1642, he was chaplain to the king; and frequent preacher before him and the court at Oxford. He afterward attended in the king's army in the condition of a chaplain. Upon the declining of his majeſty's cauſe, he retired into Wales, where he was permitted to officiate as miniſter, and to keep a ſchool, in order to maintain himſelf and his children. In this retirement he wrote ſeveral of his works. Having ſpent ſeveral years there, his family was viſited with ſickneſs; and he loſt three ſons of great hopes within the ſpace of two or three months. This affliction touched him ſo ſenſibly, that it made him deſirous to leave the country; and, going to London, he for a time officiated in a private congregation of loyaliſts to his great hazard. At length meeting with Edward lord Conway, that nobleman carried him over with him into Ireland, and ſettled him at Portmore, where he wrote his *Ductor Dubitantium*. Upon the Reſtoration he returned to England. Soon after, he was advanced to the biſhopric of Down and Connor in Ireland; and had the adminiſtration of the ſee of Dromore granted to him. He was likewiſe made privy-counſellor and vice-chancellor of the univerſity of Dublin; which place he held till his death. He died of a fever at Liſnegarvy in 1667, and was interred in a chapel which he himſelf had built on the ruins of the old cathedral of Dromore.

Taylor.

TAYLOR, *Dr Brook*, was born at Edmonton, Auguſt 18th 1685. He was the ſon of John Taylor, Eſq. of Bifrons-houſe in Kent, by Olivia, daughter of Sir Nicholas Tempeſt, of Durham, Baronet. His grandfather, Nathaniel Taylor, was one of thoſe puritans whom "Cromwell thought fit to elect by a letter, dated June 14th 1653, to repreſent the county of Bedford in parliament." The character of his father partook in no ſmall degree of the auſterity that had been tranſmitted to him in the line of his anceſtors, and by the ſpirit of the times in which they lived; and to this cauſe may be aſcribed the diſaffection which ſometimes ſubſiſted between the father and even ſuch a ſon as is the ſubject of this article. The old gentleman's moroſe temper, however, yielded to the powers of muſic; and the moſt eminent profeſſors of the art in that period were hoſpitably welcomed in his houſe. His ſon Brook was induced, by his natural genius, and by the diſpoſition of his father, which he wiſhed by all the means in his power to conciliate, to direct his particular attention to muſic; and he became in very early life a diſtinguiſhed proficient in it.—"In a large family piece, he is repreſented at the age of 13 ſitting in the centre of his brothers and ſiſters; the two elder of whom, Olivia and Mary, crown him with laurel, bearing the inſignia of harmony."

To muſic he added another accompliſhment, in which he equally excelled. "His drawings and paintings, of which ſome are ſtill preſerved, require not thoſe allowances for error or imperfection with which we ſcan the performances of even the ſuperior *dilettanti*;—they will bear the teſt of ſcrutiny and criticiſm from artiſts themſelves, and thoſe of the firſt genius and profeſſional abilities." Though he was eminent in the culture and practice both of muſic and drawing in his early youth, his whole attention was not occupied by theſe faſcinating arts. His claſſical education was conducted at home under a private tutor; and his proficiency in the ordinary branches of the languages and the mathematics was ſo great, that he was deemed qualified for the univerſity at the early age of 15.

In 1701 he was entered a fellow commoner of St John's College, Cambridge. At that period mathematics engaged more particularly the attention of the univerſity; and the examples of eminence in the learned world, derived from that branch of ſcience, attracted the notice and roufed the emulation of every youth poſſeſſed of talents and of application. We may preſume, that Brook Taylor, from the very hour of his admiſſion at

Taylor.

at college, adopted the courſe of ſtudy which a Machin, a Keil, and, above all, a Newton, had opened to the mind of man, as leading to diſcoveries of the celeſtial ſyſtem.—That he applied early to theſe ſtudies, and without remiſſion, is to be inferred from the early notice and kind attention with which he was honoured by thoſe eminent perſons, and from the extraordinary progreſs which he made in their favourite ſcience."

In 1708 he wrote his treatiſe On the Centre of Oſcillation, which was not publiſhed in the Philoſophical Tranſactions till ſome years afterwards. In 1709, he took his degree of Bachelor of Laws. In 1712, he was choſen a Fellow of the Royal Society. During the interval between theſe two periods, he correſponded with Profeſſor Keil on ſeveral of the moſt abſtruſe ſubjects of mathematical diſquiſition. Sir William Young informs us, that he has in his poſſeſſion a letter, dated in 1712, addreſſed to Mr Machin, which contains at length a ſolution of Kepler's problem, and marking the uſe to be derived from that ſolution. In this year he preſented to the Royal Society three different papers: one On the Aſcent of Water between two Glaſs Planes; a ſecond, On the Centre of Oſcillation; and a third, On the Motion of a ſtretched String. It appears from his correſpondence with Keil, that in 1713 he preſented a paper on his favourite ſubject of Muſic; but this is not preſerved in the Tranſactions.

His diſtinguiſhed proficiency in thoſe branches of ſcience, which engaged the particular attention of the Royal Society at this period, and which embroiled them in conteſts with foreign academies, recommended him to the notice of its moſt illuſtrious members; and in 1714 he was elected to the office of ſecretary. In this year he took at Cambridge his degree of Doctor of Laws: and at this time he tranſmitted, in a letter to Sir Hans Sloane, An Account of ſome curious Experiments relative to Magnetiſm; which, however, was not delivered to the Society till many years afterward, when it was printed in the Tranſactions. His application to thoſe ſtudies to which his genius inclined was indefatigable; for we find that in 1715 he publiſhed in Latin his *Methodus Incrementorum*; alſo a curious eſſay preſerved in the Philoſophical Tranſactions, entitled An Account of an Experiment for the Diſcovery of the Laws of Magnetic Attraction; likewiſe a treatiſe well known to mathematicians, and highly valued by the beſt judges, On the Principles of Linear Perſpective. In the ſame year (ſuch were his admirable talents, and ſo capable were they of being directed to various ſubjects), he conducted a controverſial correſpondence with the Count Raymond de Montmort, on the Tenets of Malebranche; which occaſioned his being particularly noticed in the eulogium pronounced by the French academy on the deceaſe of that eminent metaphyſician.

The new philoſophy of Newton (as it was then called) engaged the attention of mathematicians and philoſophers both at home and abroad. At Paris it was in high eſtimation; and the men of ſcience in that city were deſirous of obtaining a perſonal acquaintance with the learned ſecretary of the Royal Society, whoſe reputation was ſo generally acknowledged, and who had particularly diſtinguiſhed himſelf in the Leibnitzian or German controverſy, as we may denominate it, of that period. In conſequence of many urgent invitations, he determined to viſit his friends at Paris in the year 1716. He was received with every poſſible token of affection and reſpect; and had an opportunity of diſplaying many traits of character, which mark the general ſcholar and accompliſhed gentleman, as well as the profound mathematician. His company was courted by all "who had temper to enjoy, or talents to improve, the charms of ſocial intercourſe." Beſides the mathematicians, to whom he had always free acceſs, he was here introduced to Lord Bolingbroke, the Count de Caylus, and Biſhop Boſſuet.

Early in 1717 he returned to London, and compoſed three treatiſes, which were preſented to the Royal Society, and publiſhed in the 30th volume of the Tranſactions. About this time his intenſe application had impaired his health to a conſiderable degree; and he was under the neceſſity of repairing, for relaxation and relief, to Aix-la-Chapelle. Having likewiſe a deſire of directing his attention to ſubjects of moral and religious ſpeculation, he reſigned his office of ſecretary to the Royal Society in 1718.

After his return to England in 1719, he applied to ſubjects of a very different kind from thoſe that had employed the thoughts and labours of his more early life. Among his papers of this date, Sir William Young has found detached parts of A Treatiſe on the Jewiſh Sacrifices, and a diſſertation of conſiderable length On the Lawfulneſs of eating Blood. He did not, however, wholly neglect his former ſubjects of ſtudy, but employed his leiſure hours in combining ſcience and art; with this view he reviſed and improved his treatiſe on Linear Perſpective. Drawing continued to be his favourite amuſement to his lateſt hour; and it is not improbable, that his valuable life was ſhortened by the ſedentary habits which this amuſement, ſucceeding his ſeverer ſtudies, occaſioned. "He drew figures with extraordinary preciſion and beauty of pencil. Landſcape was yet his favourite branch of deſign. His original landſcapes are moſtly painted in water colours, but with all the richneſs and ſtrength of oils. They have a force of colour, a freedom of touch, a varied diſpoſition of planes of diſtance, and a learned uſe of aerial as well as linear perſpective, which all profeſſional men who have ſeen theſe paintings have admired.

The work of Dr Brook Taylor in linear perſpective was cenſured by Bernoulli, in a treatiſe publiſhed in the Acts of Leipſic, as "abſtruſe to all, and as unintelligible to artiſts for whom it was more eſpecially written." It muſt be acknowledged that this excellent work, for ſo it deſerves to be called, was not level to the apprehenſions of practitioners in the art of drawing and deſign; but it was much eſteemed by mathematicians. Three editions of it have been publiſhed; and as it is now ſcarce, a republication of it in its moſt improved and perfect ſtate would be very acceptable. Mr Kirby, however, has made it more plain and popular, in his treatiſe entitled "Brook Taylor's Perſpective made eaſy;" and this book, detailing and illuſtrating the principles of the original work, has been the *vade mecum* of artiſts. Dr Brook Taylor was incenſed by the invidious attacks of Bernoulli; and he publiſhed An Apology againſt J. Bernoulli's Objections, which may be ſeen in the 30th volume of the Philoſophical Tranſactions. Bernoulli, with his uſual envy of Britiſh mathematicians, had diſputed our author's right to his own work.

Taylor. work. We have no reason to doubt Dr Taylor's claims to the undecided discovery of the method which he describes, though he is not an original inventor. This method was long before published by Guido Ubaldi, in his Perspective, printed at Pesaro in 1600; where it is delivered very clearly, and confirmed by most elegant demonstrations; and where it is actually applied to the art of delineating the scenes of a theatre.

Toward the end of the year 1720, Dr Brook Taylor accepted the invitation of Lord Bolinbroke to spend some time at La Source, a country-seat near Orleans, which he held in right of his wife, the widow of the Marquis de Villette, nephew of Madame de Maintenon. In the next year he returned to England, and published the last paper which appears with his name in the Philosophical Transactions, entitled, An Experiment made to ascertain the Proportion of Expansion of Liquor in the Thermometer, with regard to the degree of Heat.

In 1721, Dr Brook Taylor married Miss Bridges of Wallington in the county of Surry, a young lady of good family, but of small fortune; and this marriage occasioned a rupture with his father, whose consent he had never obtained. The death of this lady in 1725, and that of an infant son, whom the parents regarded as the presage and pledge of reconciliation with the father, and who actually proved such, deeply affected the sensibility of Dr Taylor. However, during the two succeeding years he resided with his father at Bifrons, where "the musical parties, so agreeable to his taste and early proficiency, and the affectionate attentions of a numerous family welcoming an amiable brother, so long estranged by paternal resentment, not only soothed his sorrows, but ultimately engaged him to a scene of country retirement, and domesticated and fixed his habits of life. He could no more recur to the desultory resources and cold solace of society, which casual visits, slight acquaintance, and distant friendships, afford the man—who hath *none to make, and cheer a constant home.*"

In 1725 he formed a new connection; and with the full approbation of his father and family, married Sabetta, daughter of John Sawbridge, Esq. of Olantigh, in Kent. In 1729, on the death of his father, he succeeded to the family estate of Bifrons. In the following year he lost his wife in childbed. The daughter whose birth occasioned this melancholy event survived, and became the mother of Sir William Young, to whom we owe these memoirs of his grandfather.

In the interval that elapsed between the years 1721 and 1730, no production by Brook Taylor appears in the Philosophical Transactions; nor did he publish in the course of that time any work. His biographer has found no traces of his learned labour, excepting a Treatise of Logarithms, which was committed to his friend Lord Paisley (afterward Abercorn), in order to be prepared for the press; but which probably never was printed. His health was now much impaired; relaxation became necessary, and he was diverted by new connections from the habit of severe study, which had distinguished the early period of his life, and which had contributed to contract the duration of it. Happy in the social circle of domestic enjoyment, and devoting his attention to business or amusement as they occurred, his application and his literary emulation seem to have declined. He did not long survive the loss of his second wife; and his remaining days were days of increasing imbecillity and sorrow. Taylor, Tea.

"The essay entitled *Contemplatio Philosophica*, published by Sir William Young, 1793, appears to have been written about this time, and probably with a view to abstract his mind from painful recollections and regret. It was the effort of a strong mind, and is a most remarkable example of the close logic of the mathematician applied to metaphysics. But the blow was too deep at heart for study to afford more than temporary relief. The very resource was hurtful, and intense study but accelerated the decline of his health. His friends offered every comfort; in particular Lord Bolinbroke pressed his consolation, and sought to call his mind from regret of domestic endearments to social friendship at Dawley.

The attention and kindness of his friends, however, could not ward off the approaches of dissolution. "Having survived his second wife little more than a year, Dr Br - k Taylor died of a decline in the 46th year of his age, December the 29th 1731, and was buried in the church-yard of St Ann's, Soho. I am spared (says his descendant) the necessity of closing this biographical sketch with a prolix detail of his character: in the best acceptation of duties relative to each situation of life in which he was engaged, his own writings, and the writings of those who best knew him, prove him to have been the finished Christian, gentleman, and scholar."

TAYLOR-Bird. See MOTACILLA, ORNITHOLOGY *Index.*

TEA, the dried leaves of the tea plant.—A commodity with which we are so well acquainted, which affords a beverage so generally used and so generally agreeable, and which forms so considerable an article of commerce, must excite curiosity to know something of its history, and of the nature of the plant from which it is obtained.

The tea plant is a native of Japan, China, and Tonquin, and has not, as far as we can learn, been found growing spontaneously in any other parts of the world. Linnæus arranged it under the class of *polyandria*, and order of *monogynia*, and Thunberg, one of the most distinguished pupils of that illustrious botanist, who resided 16 months in Batavia and Japan, has classed it in the same manner as his master. Several of the British botanists, on the other hand, refer it to the order of *trigynia*; deriving their authority from a plant in the duke of Northumberland's garden at Sion-house, which had three styles.

Linnæus says that there are two species of the tea plant; the *bohea*, the corolla of which has six petals; and the *viridis* or green tea, which has nine petals. Thunberg makes only one species, the bohea, consisting of two varieties; the one with broad and the other with narrow leaves.

The tea plant, which is an evergreen, grows to the height of five or six feet; Le Compte says ten or twelve. The leaves, which are the only valuable part of it, are about an inch and a half long, narrow, indented, and tapering to a point, like those of the sweet briar, and of a dark green colour. The root is like that of the peach tree, and its flowers resemble those of the white wild rose. The stem spreads into many irregular branches.

Tea. branches. The wood is hard, of a whitiſh green colour, and the bark is of a greeniſh colour, with a bitter, nauſeous, and aſtringent taſte. The fruit is ſmall, and contains ſeveral round blackiſh ſeeds, about the bigneſs of a bean or large pea.

This plant delights in valleys, is frequent on the ſloping ſides of mountains and the banks of rivers, where it enjoys a ſouthern expoſure. It flouriſhes in the northern latitudes of Pekin as well as round Canton, but attains the greateſt perfection in the mild temperate regions of Nankin. It is ſaid only to be found between the 30th and 45th degree of north latitude. In Japan it is planted round the borders of fields, without regard to the ſoil; but as it is an important article of commerce with the Chineſe, whole fields are covered with it, it is by them cultivated with care. The Abbé Rochen ſays, it grows equally well in a poor as in a rich ſoil; but that there are certain places where it is of a better quality. The tea which grows in rocky ground is ſuperior to that which grows in a light ſoil; and the worſt kind is that which is produced in a clay ſoil. It is propagated by ſeeds; from ſix to twelve are put into a hole about five inches deep, at certain diſtances from each other. The reaſon why ſo many ſeeds are ſown in the ſame hole is ſaid to be, that only a fifth part vegetate. Being thus ſown, they grow without any other care. Some, however, manure the land, and remove the weeds; for the Chineſe are as fond of good tea, and take as much pains to procure it of an excellent quality, as the Europeans do to procure excellent wine.

The leaves are not fit for being plucked till the ſhrub be of three years growth. In ſeven years it riſes to a man's height; but as it then bears but few leaves, it is cut down to the ſtem, and this produces a new crop of freſh ſhoots the following ſummer. We are informed by Kœmpfer, that there are three ſeaſons in which the leaves are collected in the iſles of Japan, from which the tea derives different degrees of perfection.

The firſt gathering commences at the end of February or beginning of March. The leaves are then ſmall, tender, and unfolded, and not above three or four days old: theſe are called *ficki-tſiaa*, or "tea in powder," becauſe it is pulveriſed; it is alſo called *imperial tea*, being generally reſerved for the court and people of rank; and ſometimes alſo it is named *bloom tea*. It is ſold in China for 20d. or 2s. per pound. The labourers employed in collecting it do not pull the leaves by handfuls, but pick them one by one, and take every precaution that they may not break them. However long and tedious this labour may appear, they gather from 4 to 10 or 15 pounds a-day.

The ſecond crop is gathered about the end of March or beginning of April. At this ſeaſon part of their leaves have attained their full growth, and the reſt are not above half their ſize. This difference does not, however, prevent them from being all gathered indiſcriminately. They are afterwards picked and aſſorted into different parcels, according to their age and ſize. The youngeſt, which are carefully ſeparated from the reſt, are often ſold for leaves of the firſt crop, or for imperial tea. Tea gathered at this ſeaſon is called *too-tſiaa*, or "Chineſe tea," becauſe the people of Japan infuſe it, and drink it after the Chineſe manner.

The third crop is gathered in the end of May or in the month of June. The leaves are then very numerous and thick, and have acquired their full growth. This kind of tea, which is called *ben-tſiaa*, is the coarſeſt of all, and is reſerved for the common people. Some of the Japaneſe collect their tea only at two ſeaſons of the year, which correſpond to the ſecond and third already mentioned; others confine themſelves to one general gathering of their crop, towards the month of June: however, they always form afterwards different aſſortments of their leaves.

The fineſt and moſt celebrated tea of Japan is that which grows near Ud-ſi, a ſmall village ſituated cloſe to the ſea, and not far diſtant from Meaco. In the diſtrict of this village is a delightful mountain, having the ſame name, the climate of which is ſaid to be extremely favourable to the culture of tea; it is therefore incloſed by a hedge, and ſurrounded with wide ditches, which prevent all acceſs to it. The tea ſhrubs that grow on this mountain are planted in regular order, and are divided by different avenues and alleys.

The care of this place is entruſted to people who are ordered to guard the leaves from duſt, and to defend them from the inclemency of the weather. The labourers who are appointed to collect the tea abſtain from every kind of groſs food for ſome weeks before they begin, that their breath and perſpiration may not in the leaſt injure the leaves. They gather them with the moſt ſcrupulous nicety, and never touch them but with very fine gloves. When this choice tea has undergone the proceſs neceſſary for its preparation, it is eſcorted by the ſuperintendant of the mountain and a ſtrong guard to the emperor's court, and reſerved for the uſe of the imperial family.

As the tea ſhrub grows often on the rugged banks of ſteep mountains, acceſs to which is dangerous, and ſometimes impracticable, the Chineſe, in order to come at the leaves, are ſaid to uſe a ſingular ſtratagem: Theſe ſteep places are generally frequented by great numbers of monkeys, which being irritated and provoked, to revenge themſelves tear off the branches, and ſhower them down upon thoſe who have inſulted them. The Chineſe immediately collect theſe branches, and ſtrip them of their leaves.

When the tea leaves have been collected, they are expoſed to the ſteam of boiling water; after which they are put upon plates of copper, and held over the fire until they become dry and ſhrivelled, and appear ſuch as we have them in Europe. According to the teſtimony of Kœmpfer, tea is prepared in the ſame manner in the iſles of Japan. "There are to be ſeen there (ſays this traveller) public buildings erected for the purpoſe of preparing the freſh gathered tea. Every private perſon who has not ſuitable conveniences, or who is unacquainted with the operation, may carry his leaves thither as they dry. Theſe buildings contain a great number of ſmall ſtoves raiſed about three feet high, each of which has a broad plate of iron fixed over its mouth. The workmen are ſeated round a large table covered with mats, and are employed in rolling the tea leaves which are ſpread out upon them. When the iron plates are heated to a certain degree by the fire, they cover them with a few pounds of freſh gathered leaves, which being green and full of ſap, crackle as ſoon as they touch the plate. It is then the buſineſs of the workman to ſtir them with his naked hands as quickly as poſſible, until they become ſo warm that he cannot

Tea.

easily endure the heat. He then takes off the leaves with a kind of shovel, and lays them upon mats. The people who are employed in mixing them, take a small quantity at a time, roll them in their hands always in the same direction; while others keep continually stirring them, in order that they may cool sooner, and preserve their shrivelled figure the longer. This process is repeated two or three times, and even oftener, before the tea is deposited in the warehouses. These precautions are necessary to extract all the moisture from the leaves."

The people of Japan and China generally keep their tea a year before using it, because, when quite fresh and newly gathered, it possesses a narcotic quality which hurts the brain. Imperial tea is generally preserved in porcelain vases, or in leaden or tin canisters covered with fine mats made of bamboo. Common tea is kept in narrow-mouthed earthen pots; and coarse tea, the flavour of which is not so easily injured, is packed up in baskets of straw.

An infusion of tea is the common drink of the Chinese; and indeed when we consider one circumstance in their situation, we must acknowledge that Providence has displayed much goodness in scattering this plant with so much profusion in the empire of China. The water is said to be unwholesome and nauseous, and would therefore perhaps, without some corrective, be unfit for the purposes of life. The Chinese pour boiling water over their tea, and leave it to infuse, as we do in Europe; but they drink it without any mixture, and even without sugar. The people of Japan reduce theirs to a fine powder, which they dilute with warm water until it has acquired the consistence of thin soup. Their manner of serving tea is as follows: They place before the company the tea equipage, and the box in which this powder is contained; they fill the cups with warm water, and taking from the box as much powder as the point of a knife can contain, throw it into each of the cups, and stir it with a tooth-pick until the liquor begins to foam; it is then presented to the company, who sip it while it is warm. According to F. du Halde, this method is not peculiar to the Japanese; it is also used in some of the provinces of China.

The first European writer who mentions tea is Giovanni Botero, an eminent Italian author, who published a treatise about the year 1590, Of the Causes of the Magnificence and Greatness of Cities. He does not indeed mention its name, but describes it in such a manner that it is impossible to mistake it. "The Chinese (says he) have an herb out of which they press a delicate juice, which serves them for drink instead of wine: it also preserves their health, and frees them from all those evils which the immoderate use of wine produces among us *."

* *Anderson's Commerce*, vol. ii. p. 138.

Tea was introduced into Europe in the year 1610 by the Dutch East India Company. It is generally said, that it was first imported from Holland into England, in 1666, by the lords Arlington and Offory, who brought it into fashion among people of quality. But it was used in coffee-houses before this period, as appears from an act of parliament made in 1660, in which a duty of 8d. was laid on every gallon of the infusion sold in these places. In 1666 it was sold in London for 60s. per pound, though it did not cost more than 2s. 6d. or 3s. 6d. at Batavia. It continued at this price till 1707. In 1715 green tea began to be used; and as great quantities were then imported, the price was lessened, and the practice of drinking tea descended to the lower ranks†. In 1720 the French began to send it to us by a clandestine commerce. Since that period the demand has been increasing yearly, and it has become almost a necessary of life in several parts of Europe, and among the lowest as well as the highest ranks.

† *Hanway's Journal.*

The following table will give an idea of the quantity of tea imported annually into Great Britain and Ireland since 1717:

From 1717 to 1726	-	700,000 lbs.
1732 to 1742	-	1,200,000
1755 near	-	4,000,000
1766 -	-	6,000,000
1785 about	-	12,000,000
1794 from		16 to 20,000,000

Besides these immense quantities imported into Britain and Ireland, much has been brought to Europe by other nations. In 1766 the whole tea imported into Europe from China amounted to 17 millions of pounds; in 1785 it was computed to be about 19 millions of pounds ‡.

‡ *Raynal*, vol. i. and *Robertson's India.*

Several researches have been made in Europe to determine whether the tea plant grows spontaneously; but these reseaches have been hitherto in vain. When Captain Cook visited Teneriffe in his last voyage, Mr Anderson his surgeon was informed by a gentleman of acknowledged veracity, that a shrub is common near Santa Cruz which agrees exactly with the description given of the tea-plant by Linnæus. It is considered as a weed, and large quantities are rooted out of the vineyards every year: But the Spaniards who inhabit the island sometimes make use of it, and ascribe to it all the qualities of the tea imported from China.

Many attempts have been made to introduce this valuable plant into Europe; but from want of proper precautions most of these attempts have miscarried. The seeds, being of an oily nature, are apt to grow rancid during a long voyage, unless proper care is taken to preserve them. There are two methods of preserving these seeds: The first is, to inclose them in wax after they have been dried in the sun; the second is, to leave them in their husks, and shut them up closely in a box made of tin: but neither of these methods has been attended with general success, whatever care has been taken to obtain fresh seeds, or to preserve them. The best method would be, to sow fresh seeds in fine light earth immediately on leaving Canton, and to cover them with wire to secure them from rats and other animals that might attack them. The boxes ought not to be too much exposed to the air, nor to that kind of dew which rises from the sea. The earth in the boxes must neither be hard nor dry, and should from time to time be gently watered with fresh or rain water; and when the shoots begin to appear, they ought to be kept in a slight moisture, and sheltered from the sun. The tea-plants to be found in England have been procured by these means only; and though several of the young rising shoots perished, the last method proposed is probably that which may be followed with greatest success.

The finest tea-plant known in England was raised in Kew

Tea. Kew gardens; it was carried thither by Sir J. Ellis, who brought it from ſeed: but the firſt that ever flouriſhed in Europe was one belonging to the duke of Northumberland at Sion, from a drawing of which our engraving is taken. The plants which are cultivated in the gardens near London thrive well in the green-houſe during winter, and ſome ſtand that ſeaſon in the open air. Linnæus, who obtained this ſhrub in its growing ſtate, contrived to preſerve it in the open air in the northern latitude of Sweden. France has alſo procured ſome plants. There can be no doubt but they would ſucceed in many countries of Europe, if proper care were paid to their cultivation till they became inured to the climate. It will be a great advantage if we can rear that plant, which can never ſuffer ſo much from change of ſoil as from growing muſty during the long voyage from China. Beſides, the demand for tea is now become ſo great, that the Chineſe find it neceſſary, or at leaſt profitable, to adulterate it. Bad tea is now become an univerſal complaint. The abbé Groſier tells us, that there is a kind of moſs which grows in the neighbourhood of the little city of Mang-ing-hien, which is ſold as a delicate ſpecies of tea. If this delicious commodity is adulterated in China, can we flatter ourſelves that none comes to us but what is pure and unmixed? How would our fine ladies like to be told, that inſtead of tea they drink nothing but the infuſion of moſs from the rocks of Mang-ing-hien (F)?

Of the chemical qualities and effects of tea on the conſtitution, many various and oppoſite opinions have been formed. About a century ago, Bontikoe, a Dutch phyſician, beſtowed extravagant encomiums on the benefits of tea. With him it was good for every thing; and any quantity might be drunk, even to the amount of 200 diſhes in a day. Whether Bontikoe in this caſe acted as a phyſician, or, being a Dutchman, was eager to encourage the ſale of an important article of his country's commerce, is not eaſy to ſay. On the other hand, the pernicious effects of tea upon the nervous ſyſtem have been often repeated, and very oppoſite effects have been aſcribed to it. Some affirm that green tea is mildly aſtringent; others ſay it is relaxing: Some ſay it is narcotic, and procures ſleep; while others contend, that taken before bed-time it aſſuredly prevents it.

Dr Lettſom, who has written the Natural Hiſtory of the Tea Tree, made ſeveral experiments to determine its chemical qualities. He found an infuſion of it preſerved beef freſh; it is therefore antiſeptic: and from its ſtriking a purple colour with the ſalt (ſulphate) of iron, he he juſtly concludes that it is aſtringent. He concludes alſo, that the eſſential qualities of tea reſide in its fragrant and volatile parts.

We have heard much of the bad effects of tea, but we have neither felt nor obſerved it. If it were ſo pernicious as it has been repreſented by ſome, its effects muſt certainly be evident in China, where it is drunk by all ranks; yet ſo far from being thought hurtful in that country, it is in high eſtimation. The preſent emperor has compoſed a kind of eloge on the virtues of tea. We are told by thoſe who have written the hiſtory of China, that inflammatory diſeaſe are leſs frequent there than in many other countries, which is aſcribed ſolely to the liberal uſe of tea. It muſt be obſerved by all, that tea is an antidote againſt intemperance, and that he who reliſhes the one ſeldom runs into the other. Raynal ſays, that tea has contributed more to the ſobriety of this nation than the ſevereſt laws, the moſt eloquent harangues of Chriſtian orators, or the beſt treatiſes of morality. We have no doubt but it may be hurtful to ſome conſtitutions in particular circumſtances; but we ſuſpect that the nervous diſorders ſo often attributed to tea, are rather owing to hereditary diſeaſes, to want of exerciſe, and to irregularity in food or ſleep, than to tea.

"Weak tea drunk too hot (ſays Dr Leake) will enervate, and if very ſtrong, may prove equally pernicious by affecting the head or ſtomach. But when it is drunk in moderation, and not too warm, with a large addition of milk, I believe it will ſeldom prove hurtful, but, on the contrary, ſalutary. After ſtudy or fatigue it is a moſt refreſhing and grateful repaſt; it quenches thirſt, and cheers the ſpirits, without heating the blood; and the pleaſing ſociety, in which we ſo often partake of it is no inconſiderable addition to its value; for whatever affords rational pleaſure to the mind, will always contribute to bodily health.

In this country teas are generally divided into three kinds of green, and five of bohea: The former are, 1. Imperial or bloom tea, with a large looſe leaf, light green

(F) There is very good reaſon to believe, that the adulteration of tea is not confined to China. It is practiſed, and often with too much ſucceſs, among ourſelves. Mr Twining, a conſiderable tea dealer in London, publiſhed a pamphlet ſome years ago, in which he has expoſed this infamous traffic. The information (he ſays) was obtained from a gentleman who had made very accurate inquiries into this ſubject.

The ſmouch for mixing with black teas is made of the leaves of the aſh. When gathered, they are firſt dried in the ſun, then baked: they are next put upon a floor, and trod upon until the leaves are ſmall, then ſifted and ſteeped in copperas with ſheep's dung; after which, being dried on a floor, they are fit for uſe. There is alſo another mode: When the leaves are gathered, they are boiled in a copper with copperas and ſheep's dung; when the liquor is ſtrained off, they are baked and trod upon, until the leaves are ſmall, after which they are fit for uſe. The quantity manufactured at a ſmall village, and within eight or ten miles thereof, cannot be aſcertained, but is ſuppoſed to be about 20 tons in a year. One man acknowledges to have made 600 weight in every week for ſix months together. The fine is ſold at 4l. 4s. per cwt. equal to 9d. per lb. The coarſe is ſold at 2l. 2s. per cwt. equal to 4½d. per lb. Elder buds are manufactured in ſome places to repreſent fine teas.

For the honour of human nature, we hope ſuch a traffic as this is not very common; but if it be, thoſe concerned in it deſerve exemplary puniſhment. The only way (Mr Twining ſays) to eſcape this adulterated tea, is never to purchaſe from thoſe who offer their teas to ſale at lower prices than genuine teas can be afforded; but to purchaſe them only from perſons of character.

green colour, and a faint delicate ſmell. 2. Hyſon, ſo called from the name of the merchant who firſt imported it; the leaves of which are cloſely curled and ſmall, of a green colour, verging to a blue: And, 3. Singlo tea, from the name of the place where it is cultivated. The boheas are, 1. Souchong, which imparts a yellow green colour by infuſion. 2. Cambo, ſo called from the place where it is made; a fragrant tea, with a violet ſmell; its infuſion pale. 3. Congo, which has a larger leaf than the following, and its infuſion ſomewhat deeper, reſembling common bohea in the colour of the leaf. 4. Pekoe tea; this is known by the appearance of ſmall white flowers mixed with it. 5. Common bohea, whoſe leaves are of one colour. There are other varieties, particularly a kind of green tea, done up in roundiſh balls, called *gunpowder tea*.

Tea-Tree of New Zealand, is a ſpecies of myrtle, of which an infuſion was drunk by Captain Cook's people in their voyages round the world. Its leaves were finely aromatic, aſtringent, and had a particular pleaſant flavour at the firſt infuſion; but this went off at the next filling up of the tea-pot, and a great degree of bitterneſs was then extracted; for which reaſon it was never ſuffered to be twice infuſed. In a fine ſoil in thick foreſts this tree grows to a conſiderable ſize; ſometimes 30 or 40 feet in height, and one foot in diameter. On a hilly and dry expoſure it degenerates into a ſhrub of five or ſix inches; but its uſual ſize is about eight or ten feet high, and three inches in diameter. In that caſe its ſtem is irregular and unequal, dividing very ſoon into branches, which ariſe at acute angles, and only bear leaves and flowers at top. The flowers are white, and very ornamental to the whole plant.

Mr White, in his Journal of a Voyage to New South Wales, mentions a ſhrub which he calls a *tea-tree*, merely from its being uſed by the convicts as a ſuccedaneum for tea; for he had not ſeen the flower, nor did he know to what genus it belonged. It is a creeping kind of a vine, running to a great extent along the ground; the ſtalk ſlender; the leaf not ſo large as the common bay leaf; the taſte ſweet, exactly like the liquorice root of the ſhops.

TEACHERS, perſons employed in conducting the education of the young.

We will venture to ſay, that there is no claſs of men to whom a nation is ſo much indebted as to thoſe employed in inſtructing the young: For if it be education that forms the only diſtinction between the civilized and the ſavage, much certainly is due to thoſe who devote themſelves to the office of inſtruction. It muſt be the duty therefore of every ſtate to take care that proper encouragement be given to thoſe who undertake this office. There ought to be ſuch a ſalary as would render it an object of ambition to men of abilities and learning, or at leaſt as would keep the teacher reſpectable. In Scotland, the office of a ſchoolmaſter was formerly much more lucrative than at preſent, and moſt of that claſs had received liberal education; and this is the reaſon why the common people in Scotland have been famous even to a proverb, for their learning. But at preſent the ſalary of a country ſchoolmaſter, independent of fees for ſcholars, is not greater than a ploughman can earn, being ſeldom more than 8l. 6s. 8d. the conſequence of which is that this, which is in fact an honourable, becauſe an uſeful profeſſion, is now ſinking into contempt. It is no longer an object to a man of learning; and we muſt ſoon be ſatisfied with ſchoolmaſters that can read, write, and caſt accounts, a little better than the loweſt of the people, or who from ſome natural deformity are unable to exercise a trade. And what in this caſe muſt become of the minds of the common people? They muſt be totally uncultivated.

We have obſerved a great difference between the cultivation of the common people in one part of Scotland compared with another; and we have found, that wherever a ſchoolmaſter is looked upon as a mean profeſſion there is ſcarcely a duly qualified perſon to be found to undertake the office; and in thoſe places the common people are lamentably ignorant. In other places again, where the ſchoolmaſter is conſidered as one of the principal perſons in the pariſh, there men of a liberal education, young divines, and preachers, do not think themſelves diſgraced by exerciſing this profeſſion; and there the common people ſhow a degree of acuteneſs, knowledge, and obſervation, and poſſeſs ſuch poliſhed manners, as raiſe them very high above thoſe of their own rank in other parts of the country.

Many and keen have been the debates about a reform of government of late years; but little attention has been paid to the formation of the minds of the common people, who conſtitute the greater part of the nation; of courſe they are ready to join the ſtandard of every ſeditious demagogue who ſounds the alarm of oppreſſion; and ſhould they at length be rouſed, their cruelty and barbarity, like the common people of France, would be exactly in proportion to their ignorance and want of principle.

We are willing to hope, then, that the government and the moneyed men of the nation, who alone have property to loſe and money to beſtow, will at length find it to be their intereſt to patronize ſchoolmaſters.

TEAL. See ANAS, ORNITHOLOGY *Index*.

TEARS, a lymph or aqueous humor, which is limpid, and a little ſaltiſh: it is ſeparated from the arterial blood by the lachrymal glands and ſmall glandulous grains on the inſide of the eyelids.

TEASELS, a plant cultivated in the weſt of England for the uſe of clothiers. See DIPSACUS, BOTANY *Index*.

TEBETH, the tenth month of the Jewiſh eccleſiaſtical year, and fourth of the civil. It anſwers to our month of December.

TECLENBURG, a town of Germany, in the circle of Weſtphalia, capital of a county of the ſame name, with a caſtle built on a hill. It was bought by the king of Pruſſia in 1707. E. Long. 8. 2. N. Lat. 52. 20.

TECHNICAL, expreſſes ſomewhat relating to arts or ſciences: in this ſenſe we ſay technical terms. It is alſo particularly applied to a kind of verſes wherein are contained the rules or precepts of any art, thus digeſted to help the memory to retain them; an example whereof may be ſeen in the article MEMORY.

TECTONA, TEAK-WOOD, a genus of plants belonging to the claſs pentandria. See BOTANY, p. 139.

TE DEUM, the name of a celebrated hymn, uſed in the Chriſtian church, and ſo called becauſe it begins with theſe words, *Te Deum laudamus*, We praiſe thee, O God. It is ſung in the Romiſh church with great pomp

pomp and ſolemnity upon the gaining of a victory, or other happy event; and is believed to be the compoſition of St Ambrose biſhop of *Milan*.

TEES, a river which riſes on the confines of Cumberland, and running eaſtward, divides the county of Durham from Yorkſhire, and falls into the German ſea below Stockton.

TEETH, the bones placed in the jaws for chewing food, that it may be the more eaſily digeſted in the ſtomach. The anatomical ſtructure of the teeth has already been deſcribed under Anatomy. The diſeaſes to which they are liable, as well as the moſt ſucceſsful remedies for removing them, are fully detailed under Medicine and Surgery.

Much attention has been paid to the beauty and preſervation of the teeth among moſt nations. The Romans rubbed and waſhed them with great care; and when they loſt them, ſupplied their place with artificial teeth made of ivory; and ſometimes, when looſe, bound them with gold. Ligatures of wire have been found to hurt the natural teeth with which the artificial are connected: whereas ſilken twiſt cannot affect them to any conſiderable degree for ſeveral years.

Guilleman gives us the compoſition of a paſte for making artificial teeth, which ſhall never grow yellow: the compoſition is white wax granulated, and melted with a little gum elemi, adding powder of white maſtich, coral, and pearl.

When ſeveral teeth are out in the ſame place, it is beſt to make a ſet, or the number wanted, out of one piece, all adhering together, which may be faſtened to the two next of the ſound or natural teeth. And even a whole ſet of artificial teeth may be made for one or both jaws, ſo well fitted to admit of the neceſſary motions, and ſo conveniently retained in the proper ſituation by means of ſprings, that they will anſwer every purpoſe of natural teeth, and may be taken out, cleaned, and replaced, by the patient himſelf with great eaſe.

The common trick of mountebanks and other ſuch practitioners, is to uſe various waſhes for teeth, the ſudden effects of which, in cleaning and whitening the teeth, ſurpriſe and pleaſe people; but the effects are very pernicious. All the ſtrong acid ſpirits will do this. As good a mixture as any thing can be, on this occaſion, is the following: take plantane-water an ounce, honey of roſes two drams, muriatic acid ten drops; mix the whole together, and rub the teeth with a piece of linen rag dipped in this every day till they are whitened. The mouth ought to be well waſhed with cold water after the uſe of this or any other acid liquor; and indeed the beſt of all teeth waſhes is cold water, with or without a little ſalt; the conſtant uſe of this will keep them clean and white, and prevent them from aching.

After all the numerous cures which have been propoſed for preventing the toothach, we will venture to recommend the keeping the teeth clean as the moſt efficacious, and avoiding every kind of hot food, eſpecially hot liquids, as tea, &c. They who are conſtantly uſing powders generally deſtroy their teeth altogether, as the valetudinarian does his health.

TEETHING in children. See Medicine.

TEFF, a kind of grain, ſown all over Abyſſinia, from which is made the bread commonly uſed throughout the country. We have no deſcription of this plant but from Mr Bruce, who ſays that it is herbaceous; and that from a number of weak leaves ſurrounding the root proceeds a ſtalk of about 28 inches in length, not perfectly ſtraight, ſmooth, but jointed or knotted at particular diſtances. This ſtalk is not much thicker than that of a carnation or julyflower. About eight inches from the top, a head is formed of a number of ſmall branches, upon which it carries the fruit and flowers; the latter of which is ſmall, of a crimſon colour, and ſcarcely perceptible by the naked eye but from the oppoſition of that colour. The piſtil is divided into two, ſeemingly attached to the germ of the fruit, and has at each end ſmall capillaments forming a bruſh. The ſtamina are three in number; two on the lower ſide of the piſtil, and one on the upper. Theſe are each of them crowned with two oval ſtigmata, at firſt green, but after crimſon. The fruit is formed in a capſula, conſiſting of two conical hollow leaves, which, when cloſed, ſeems to compoſe a ſmall conical pod, pointed at the top. The fruit or ſeed is oblong, and is not ſo large as the head of the ſmalleſt pin; yet it is very prolific, and produces theſe ſeeds in ſuch quantity as to yield a very abundant crop in the quantity of meal.

Our author, from the ſimilarity of the names, conjectures it to be the *tipha* mentioned, but not deſcribed, by Pliny; but this conjecture, which he acknowledges to be unſupported, is of very little importance.

There are three kinds of meal made from teff, of which the beſt (he ſays) is as white as flour, exceedingly light, and eaſily digeſted; the ſecond is of a browner colour; and the laſt, which is the food of ſoldiers and ſervants, is nearly black. This variety he imagines to ariſe entirely from the difference of ſoils in which the ſeeds are ſown, and the different degrees of moiſture to which the plant is expoſed when growing. The manner of making the meal or flour into bread is by taking a broad earthen jar, and having made a lump of it with water, they put it into an earthen jar at ſome diſtance from the fire, where it remains till it begins to ferment or turn ſour; they then bake it into cakes of a circular form, and about two feet in diameter: it is of a ſpungy ſoft quality, and not a diſagreeable ſouriſh taſte. Two of theſe cakes a-day, and a coarſe cotton cloth once a-year, are the wages of a common ſervant.

At their banquets of raw meat, the fleſh being cut in ſmall bits, is wrapt up in pieces of this bread, with a proportion of foſſil ſalt and Cayenne pepper. Before the company ſits down to eat, a number of theſe cakes of different qualities are placed one upon the other, in the ſame manner as our plates, and the principal people ſitting firſt down, eat the white teff; the ſecond or coarſer ſort ſerves the ſecond rate people that ſucceed them, and the third is for the ſervants. Every man, when he is done, dries or wipes his fingers upon the bread which he is to leave for his ſucceſſor, for they have no towels; and this is one of the moſt beaſtly cuſtoms among them.

Of this teff bread the natives make a liquor, by a proceſs which our author deſcribes in the following words: The bread, when well toaſted, is broken into ſmall pieces, which are put into a large jar, and have warm water poured upon them. It is then ſet by the fire, and frequently ſtirred for ſeveral days, the mouth of the jar being cloſe covered. After being allowed to ſettle three or four days, it acquires a ſouriſh taſte, and is what they call *bouza*, or the common beer of the country. The bouza in Atbara is made in the ſame manner, only in-

ſtead

Tefflis, Tegerhy.

ſtead of teff, cakes of barley meal are employed. Both are very bad liquors, but the worſt is that made of barley.

TEFFLIS, or TIFFLIS, a town of Aſia, in Georgia, one of the ſeven nations between the Black ſea and the Caſpian. It is the capital of that country, the place of reſidence of its ſovereign, and is called by the inhabitants *Thilis-Cabar*, "warm town," from the warm baths in its neighbourhood. Though its circumference does not exceed two Engliſh miles, it contains 20,000 inhabitants, of which more than half are Armenians; the remainder are principally Georgians, with ſome Tartars. According to Major Rennel, it has 20 Armenian and 15 Greek churches, and three metſheds. But Mr Coxe, on the authority of Profeſſor Guldenſtaedt, ſtates the places of worſhip to be one Roman Catholic, 13 Greek, and ſeven Armenian churches. There are ſome magnificent caravanſeras, bazars, and palaces in the city, but no moſques; for the Georgians, though living under a Mohammedan government, have always riſen up in arms as often as any attempts have been made to erect ſuch places of Mohammedan worſhip. Many of the Romiſh miſſionaries live here in diſguiſe under the denomination of phyſicians, ſurgeons, and chemiſts; and the great cures which they perform procure them much eſteem, though they are ſometimes expoſed to the inſults of the people when they attempt to make any proſelytes to their church. All the houſes are of ſtone, with flat roofs, which ſerve, according to the cuſtoms of the Eaſt, as walks for the women. They are neatly built; the rooms are wainſcotted, and the floors ſpread with carpets. The ſtreets ſeldom exceed ſeven feet in breadth; and ſome are ſo narrow as ſcarcely to allow room for a man on horſeback: they are conſequently very filthy.

Tefflis is a place of conſiderable trade, eſpecially in furs, which are conveyed hence to Conſtantinople by the way of Erzerum. As for the ſilks of this country, they are bought up on the ſpot by the Armenians, and conveyed to Smyrna and other ports of the Mediterranean; but the greateſt part is firſt ſent to Erzerum to be manufactured, the Georgians being very ignorant and unſkilful in that reſpect. From hence, likewiſe, great quantities of a root called *boya* is ſent to Erzerum and Indoſtan for the uſe of the linen dyers. Here is likewiſe a foundery, at which are caſt a few cannon, mortars, and balls, all of which are very inferior to thoſe of the Turks. The gunpowder made here is very good. The Armenians have likewiſe eſtabliſhed in this town all the manufactures carried on by their countrymen in Perſia: the moſt flouriſhing is that of printed linens. Tefflis is ſeated on the river Kur, at the foot of a mountain; and on the ſouth ſide of it ſtands a large caſtle or fortreſs, built by the Turks in 1576, when they made themſelves maſters of the city and country, under the command of the famous Muſtapha Pacha. It is 125 miles weſt of Terki. E. Long. 63. 3. N. Lat. 41. 59.

TEGERHY, a principal town in Fezzan, in Africa, about 80 miles ſouth-weſt of the capital. It collects from its lands little other produce than dates and Indian corn. In this, as in every town in Fezzan, a market for butcher-meat, corn, fruit, and vegetables, is regularly held. Mutton and goats fleſh are ſold by the quarter without weighing; the uſual price is from 32 to 40 grains of gold-duſt, or four or five ſhillings Engliſh money. The fleſh of the camel, which is much more highly valued, is commonly ſold at a dearer rate, and is divided into ſmaller lots. Agriculture and paſturage ſeem to be the principal occupations.

Tegument || Telegraph.

TEGUMENT, any thing that ſurrounds or covers another.

TEIND, in *Scots Law*. See LAW, N° clxx.

Commiſſion of TEINDS. See COMMISSION.

TEINTS, and SEMITEINTS, in *Painting*, denote the ſeveral colours uſed in a picture, conſidered as more or leſs high, bright, deep, thin, or weakened and diminiſhed, &c. to give the proper relievo, ſoftneſs, or diſtance, &c. of the ſeveral objects.

TELEGRAPH (derived from τηλε and γραφω), is the name very properly given to an inſtrument, by means of which information may be almoſt inſtantaneouſly conveyed to a conſiderable diſtance.

The telegraph, though it has been generally known and uſed by the moderns only for a few years, is by no means a modern invention. There is reaſon to believe that amongſt the Greeks there was ſome ſort of telegraph in uſe. The burning of Troy was certainly known in Greece very ſoon after it happened, and before any perſon had returned from thence. Now that was altogether ſo tedious a piece of buſineſs, that conjecture never could have ſupplied the place of information. A Greek play begins with a ſcene, in which a watchman deſcends from the top of a tower in Greece, and gives the information that Troy was taken. "I have been looking out theſe ten years (ſays he) to ſee when that would happen, and this night it is done." Of the antiquity of a mode of conveying intelligence quickly to a great diſtance, this is certainly a proof.

The Chineſe, when they ſend couriers on the great canal, or when any great man travels there, make ſignals by fire from one day's journey to another, to have every thing prepared; and moſt of the barbarous nations uſed formerly to give the alarm of war by fires lighted on the hills or riſing grounds.

Polybius calls the different inſtruments uſed by the ancients for communicating information πυρσειαι, *pyrſiæ*, becauſe the ſignals were always made by means of fire. At firſt they communicated information of events merely by torches; but this method was of little uſe, becauſe it was neceſſary before-hand to fix the meaning of every particular ſignal. Now as events are exceedingly various, it was impoſſible to expreſs the greater number of them by any premeditated contrivance. It was eaſy, for inſtance, to expreſs by ſignals that a fleet had arrived at ſuch a place, becauſe this had been foreſeen, and ſignals accordingly had been agreed upon to denote it; but an unexpected revolt, a murder, and ſuch accidents, as happen but too often, and require an immediate remedy, could not be communicated by ſuch ſignals; becauſe to foreſee them was impoſſible.

Æneas, a contemporary of Ariſtotle, who wrote a treatiſe on the duties of a general, endeavoured to correct thoſe imperfections, but by no means ſucceeded. "Thoſe (ſays he) who would give ſignals to one another upon affairs of importance, muſt firſt prepare two veſſels of earth, exactly equal in breadth and depth; and they need be but four feet and a half deep, and a foot and a half wide. They then muſt take pieces of cork, proportioned to the mouth of theſe veſſels, but not quite ſo wide, that they may be let down with eaſe to the bottom of theſe veſſels. They next fix in the middle of this

Polybius, book x. chap. 40.

Fig. 1.

Fig. 2.

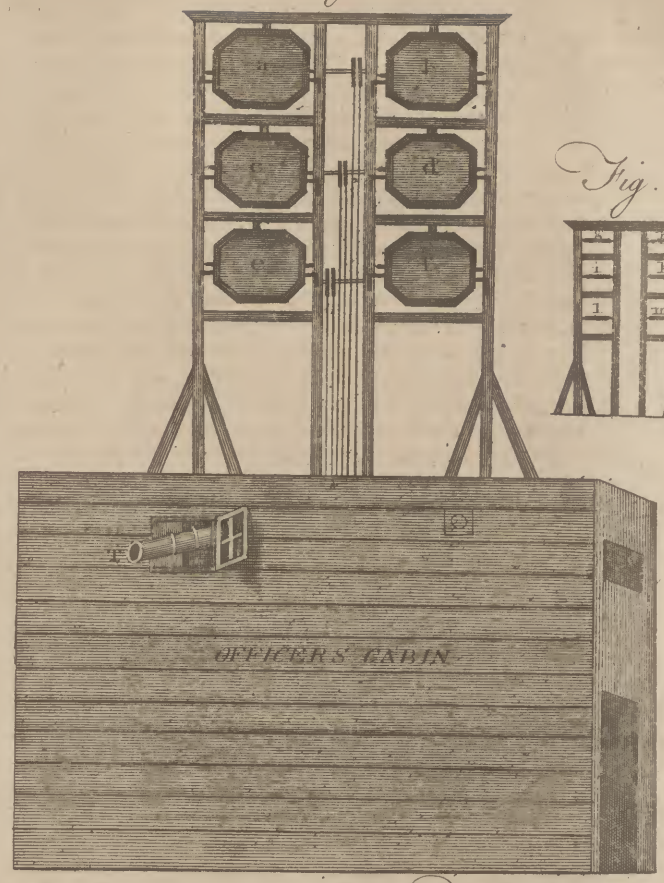
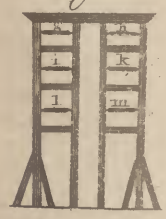


Fig. 3.



TELESCOPE

Fig. 1.

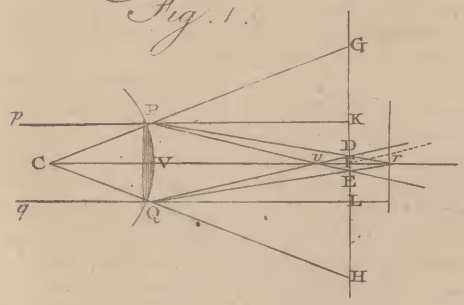


Fig. 3.

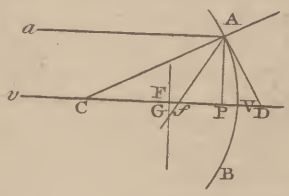


Fig. 2.

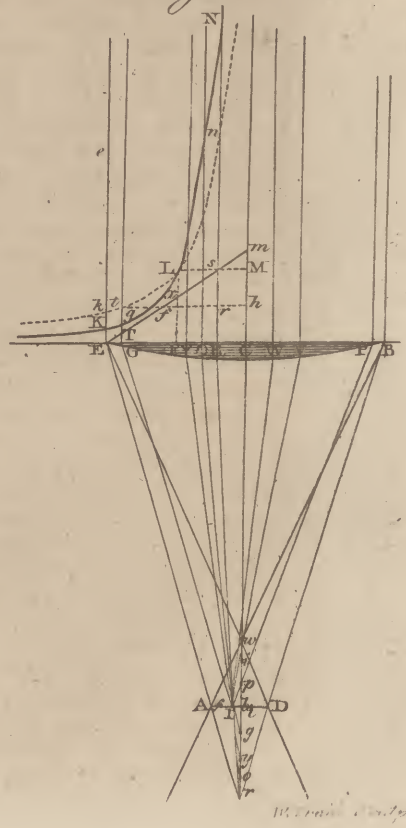


Fig. 4.

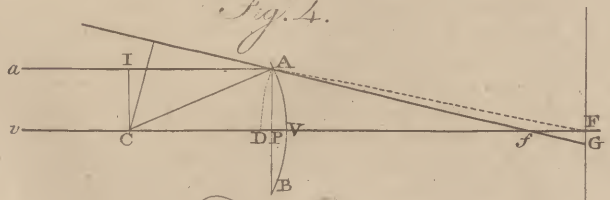
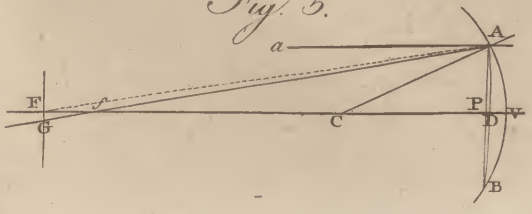


Fig. 5.



Telegraph.

this cork a ſtick, which muſt be of equal ſize in both theſe veſſels. This ſtick muſt be divided exactly and diſtinctly, by ſpaces of three inches each, in order that ſuch events as generally happen in war may be written on them. For example, on one of theſe ſpaces the following words may be written: 'A BODY OF HORSE ARE MARCHED INTO THE COUNTRY.' On another, 'A BODY OF INFANTRY, heavily armed, are arrived hither'. On a third, 'INFANTRY LIGHTLY ARMED. On a fourth, 'HORSE AND FOOT.' On another, 'SHIPS;' then 'PROVISIONS;' and ſo on till all the events which may probably happen in the war that is carrying on are marked in theſe intervals.

This being done, each of the two veſſels muſt have a little tube or cock of equal bigneſs, to let out the water in equal proportion. Then the two veſſels muſt be filled with water; the pieces of cork, with their ſticks thruſt through them, muſt be laid upon them, and the cocks muſt be opened. Now, it is plain, that as theſe veſſels are equal, the corks will ſink, and the ſticks deſcend lower in the veſſels, in proportion as they empty themſelves. But to be more certain of this exactneſs, it will be proper to make the experiment firſt, and to examine whether all things correſpond and agree together, by an uniform execution on both ſides. When they are well aſſured of this, the two veſſels muſt be carried to the two places where the ſignals are to be made and obſerved: water is poured in, and the corks and ſticks are put in the veſſels. When any of the events which are written on the ſticks ſhall happen, a torch or other light is raiſed, which muſt be held aloft till ſuch time as another is raiſed by the party to whom it is directed. (This firſt ſignal is only to give notice that both parties are ready and attentive). Then the torch or other light muſt be taken away, and the cocks ſet open. When the interval, that is that part of the ſtick where the event of which notice is to be given or written, ſhall be fallen to a level with the veſſels, then the man who gives the ſignal lifts up his torch; and on the other ſide, the correſpondent ſignal-maker immediately turns the cock of his veſſel, and looks at what is writ on that part of the ſtick which touches the mouth of the veſſel: on which occaſion, if every thing has been executed exactly and equally on both ſides, both will read the ſame thing."

This method was defective, becauſe it could not convey any other intelligence except what was written on the ſticks, and even that not particularly enough. With regard to all unforeſeen events, it was quite uſeleſs.

Polybius, Ibid.

A new method was invented by Cleoxenus (others ſay by Democlitus), and very much improved by Polybius, as he himſelf informs us. He deſcribes this method as follows: Take the letters of the (Greek) alphabet, and divide them into five parts, each of which will conſiſt of five letters, except the laſt diviſion, which will have only four. Let theſe be fixed on a board in five columns. The man who is to give the ſignals is then to begin by holding up two torches, which he is to keep aloft till the other party has alſo ſhown two. This is only to ſhow that both ſides are ready. Theſe firſt torches are then withdrawn. Both parties are provided with boards, on which the letters are diſpoſed as formerly deſcribed. The perſon who then gives the ſignal is to hold up torches on the left to point out to the other party from what column he ſhall take the letters as they are pointed out to him. If it is to be from the firſt column, he holds up one torch; if from the ſecond, two; and ſo on for the others. He is then to hold up torches on the right, to denote the particular letter of the column that is to be taken. All this muſt have been agreed on before-hand. The man who gives the ſignals muſt have an inſtrument (διοπτραν), conſiſting of two tubes, and ſo placed as that, by looking through one of them, he can ſee only the right ſide, and through the other only the left, of him who is to anſwer. The board muſt be ſet up near this inſtrument; and the ſtation on the right and left muſt be ſurrounded with a wall (παραπεφραχθαι) ten feet broad, and about the height of a man, that the torches raiſed above it may give a clear and ſtrong light, and that when taken down they may be completely concealed. Let us now ſuppoſe that this information is to be communicated.—*A number of the auxiliaries, about a hundred, have gone over to the enemy.* In the firſt place, words muſt be choſen that will convey the information in the feweſt letters poſſible; as, *A hundred Cretans have deſerted*, Κρῆτες ἑκατὸν ἀφ' ἡμῶν ἠλωμοληκαν. Having written down this ſentence, it is conveyed in this manner. The firſt letter is a K, which is in the ſecond column; two torches are therefore to be raiſed on the left hand to inform the perſon who receives the ſignals to look into that particular column. Then five torches are to be held up on the right, to mark the letter *k*, which is the laſt in the column. Then four torches are to be held up on the left to point out the ρ (*r*), which is in the fourth column, and two on the right to ſhow that it is the ſecond letter of that column. The other letters are pointed out in the ſame manner. —Such was the *pyrſia* or telegraph recommended by Polybius.

But neither this nor any other method mentioned by the ancients ſeems ever to have been brought into general uſe; nor does it appear that the moderns had thought of ſuch a machine as a *telegraph* till the year 1663, when the Marquis of Worceſter, in his CENTURY OF INVENTIONS, affirmed that he had diſcovered "a method by which, at a window, as far as eye can diſcover black from white, a man may hold diſcourſe with his correſpondent, without noiſe made or notice taken; being according to occaſion given, or means afforded, *ex re nata*, and no need of proviſion before hand; though much better if foreſeen, and courſe taken by mutual conſent of parties." This could be done only by means of a telegraph, which in the next ſentence is declared to have been rendered ſo perfect, that by means of it the correſpondence could be carried on "by night as well as by day, though as dark as pitch is black."

About 40 years afterwards M. Amontons propoſed a new telegraph. His method was this: Let there be people placed in ſeveral ſtations, at ſuch a diſtance from one another, that by the help of a teleſcope a man in one ſtation may ſee a ſignal made in the next before him; he muſt immediately make the ſame ſignal, that it may be ſeen by perſons in the ſtation next after him, who are to communicate it to thoſe in the following ſtation, and ſo on. Theſe ſignals may be as letters of the alphabet, or as a cipher, underſtood only by the two perſons who are in the diſtant places, and not by thoſe who make the ſignals. The perſon in the ſecond ſtation making the ſignal to the perſon in the third the very moment he ſees it in the firſt, the news may be carried to the greateſt

Telegraph. distance in as little time as is necessary to make the signals in the first station. The distance of the several stations, which must be as few as possible, is measured by the reach of a telescope. Amontons tried this method in a small tract of land before several persons of the highest rank at the court of France.

It was not, however, till the French revolution that the telegraph was applied to useful purposes. Whether M. Chappe, who is said to have invented the telegraph first used by the French about the end of 1793, knew any thing of Amontons's invention or not, it is impossible to say; but his telegraph was constructed on principles nearly similar. The manner of using this telegraph was as follows: At the first station, which was on the roof of the palace of the Louvre at Paris, M. Chappe, the inventor, received in writing, from the committee of public welfare, the words to be sent to Lisle, near which the French army at that time was. An upright post was erected on the Louvre, at the top of which were two transverse arms, moveable in all directions by a single piece of mechanism, and with inconceivable rapidity. He invented a number of positions for these arms, which stood as signs for the letters of the alphabet; and these, for the greater celerity and simplicity, he reduced in number as much as possible. The grammarian will easily conceive that sixteen signs may amply supply all the letters of the alphabet, since some letters may be omitted not only without detriment but with advantage. These signs, as they were arbitrary, could be changed every week; so that the sign of B for one day might be the sign of M the next; and it was only necessary that the persons at the extremity should know the key. The intermediate operators were only instructed generally in these sixteen signals; which were so distinct, so marked, so different the one from the other, that they were easily remembered. The construction of the machine was such, that each signal was uniformly given in precisely the same manner at all times: It did not depend on the operator's manual skill; and the position of the arm could never, for any one signal, be a degree higher or a degree lower, its movement being regulated mechanically.

M. Chappe having received at the Louvre the sentence to be conveyed, gave a known signal to the second station, which was Mont Martre, to prepare. At each station there was a watch tower, where telescopes were fixed, and the person on watch gave the signal of preparation which he had received, and this communicated successively through all the line, which brought them all into a state of readiness. The person at Mont Martre then received, letter by letter, the sentence from the Louvre, which he repeated with his own machine; and this was again repeated from the next height, with inconceivable rapidity, to the final station at Lisle.

English Review, June 1796. The first description of the telegraph was brought from Paris to Frankfort on the Maine by a former member of the parliament of Bourdeaux, who had seen that which was erected on the mountain of Belville. As given by Dr Hutton from some of the English papers, it is as follows. AA is a beam or mast of wood placed upright on a rising ground (fig. 1.), which is about 15 or 16 feet high. BB is a beam or balance moving upon the centre AA. This balance-beam may be placed vertically or horizontally, or any how inclined, by means of strong cords, which are fixed to the wheel D, on the edge of which is a double groove to receive the two cords. This balance is about 11 or 12 feet long, and nine inches broad, having at the ends two pieces of wood CC, which likewise turn upon angles by means of four other cords that pass through the axis of the main balance, otherwise the balance would derange the cords; the pieces C are each about three feet long, and may be placed either to the right or left, straight or square, with the balance-beam. By means of these three the combination or movement is very extensive, remarkably simple, and easily performed. Below is a small wooden gouge or hut, in which a person is employed to observe the movements of the machine. In the mountain nearest to this another person is to repeat these movements, and a third to write them down. The time taken up for each movement is 20 seconds; of which the motion alone is four seconds, the other 16 the machine is stationary. Two working models of this instrument were executed at Frankfort, and sent by Mr W. Playfair to the duke of York; and hence the plan and alphabet of the machine came to England.

Plate DXXVIII. Fig. 1.

Various experiments were in consequence tried upon telegraphs in this country; and one was soon after set up by government in a chain of stations from the admiralty-office to the sea coast. It consists of six octagon boards, each of which is poised upon an axis in a frame, in such a manner that it can be either placed vertically, so as to appear with its full size to the observer at the nearest station, as in fig. 2. or it becomes invisible to him by being placed horizontally, as in fig. 3. so that the narrow edge alone is exposed, which narrow edge is from a distance invisible. Fig. 2. is a representation of this telegraph, with the parts all shut, and the machine ready to work. T, in the officer's cabin, is the telescope pointed to the next station. Fig. 3. is a representation of the machine not at work, and with the ports all open. The opening of the first port (fig. 2.) expresses *a*, the second *b*, the third *c*, the fourth *d*, the fifth *e*, the sixth *f*, &c.

Fig. 2.

Fig. 3.

Six boards make 36 changes, by the most plain and simple mode of working; and they will make many more if more were necessary: but as the real superiority of the telegraph over all other modes of making signals consists in its making letters, we do not think that more changes than the letters of the alphabet, and the ten arithmetical ciphers, are necessary; but, on the contrary, that those who work the telegraphs should avoid communicating by words or signs agreed upon to express sentences; for that is the sure method never to become expert at sending unexpected intelligence accurately.

This telegraph is without doubt made up of the best number of combinations possible; five boards would be insufficient, and seven would be useless. It has been objected to it, however, that its form is too clumsy to admit of its being raised to any considerable height above the building on which it stands; and that it cannot be made to change its direction, and consequently cannot be seen but from one particular point.

Several other telegraphs have been proposed to remedy these defects, and perhaps others to which the instrument is still liable. The dial-plate of a clock would make an excellent telegraph, as it might exhibit 144 signs so as to be visible at a great distance. A telegraph on this principle, with only six divisions instead of twelve,

Telegraph. twelve, would be ſimple and cheap, and might be raiſed 20 or 30 feet high above the building without any difficulty: it might be ſupported on one poſt, and therefore turn round, and the contraſt of colours would always be the ſame.

Supplement for 1794. A very ingenious improvement of the telegraph has been propoſed in the Gentleman's Magazine. It conſiſts of a ſemicircle, to be properly elevated, and fixed perpendicularly on a ſtrong ſtand. The radius 12 feet; the ſemicircle conſequently ſomewhat more than 36. This to be divided into 24 parts. Each of theſe will therefore compriſe a ſpace of 18 inches, and an arch of 7° 30′ on the circumference. Theſe 24 diviſions to be occupied by as many circular apertures of ſix inches diameter; which will leave a clear ſpace of ſix inches on each ſide between the apertures. Theſe apertures, beginning from the left, to denote the letters of the alphabet, omitting K, J conſonant, V, X, and Q, as uſeleſs for this purpoſe. There are then 21 letters. The four other ſpaces are reſerved for ſignals. The inſtrument to have an index moveable by a windlaſs on the centre of the ſemicircle, and having two tops, according as it is to be uſed in the day or night; one, a circular top of lacquered iron or copper, of equal diameter with the apertures (and which conſequently will eclipſe any of them againſt which it reſts); the other, a ſpear or arrow-ſhaped top, black and highly poliſhed, which, in ſtanding before any of the apertures in the day-time, will be diſtinctly viſible. In the night, the apertures to be reduced by a diaphragm fitting cloſe to each, ſo as to leave an aperture of not more than two inches diameter. The diaphragm to be of well-poliſhed tin; the inner rim lacquered black half an inch. All the apertures to be illuminated, when the inſtrument is uſed in the night-time, by ſmall lamps; to which, if neceſſary, according to circumſtances, convex lenſes may be added, fitted into each diaphragm, by which the light may be powerfully concentrated and increaſed. Over each aperture one of the five priſmatic colours leaſt likely to be miſtaken (the remaining two being leſs diſtinguiſhable, and not wanted, are beſt omitted) to be painted; and, in their natural order, on a width of eighteen inches and a depth of four, red, orange, yellow, green, blue; or, ſtill to heighten the contraſt, and render immediately ſucceſſive apertures more diſtinguiſhable, red, green, orange, blue, yellow. The whole inner circle beneath and between the apertures to be painted black.

When the inſtrument is to be uſed, the index to be ſet to the ſignal apertures on the right. All the apertures to be covered or dark when it begins to be uſed, except that which is to give the ſignal. A ſignal gun to be fired to appriſe the obſerver. If the index is ſet to the firſt aperture, it will denote that words are to be expreſſed; if to the ſecond, that figures; if to the third, that the figures ceaſe; and that the intelligence is carried on in words. When figures are to be expreſſed, the alternate apertures from the left are taken in their order, to denote from 1 to 10 incluſively; the ſecond from the right denotes 100; the fifth 1000. This order, and theſe intervals, are taken to prevent any confuſion in ſo peculiarly important an article of the intelligence to be conveyed. Telegraph.

Perhaps, however, none of the telegraphs hitherto offered to the public exceeds the following, either in ſimplicity, cheapneſs, or facility in working, and it might perhaps, with a few trifling additions, be made exceedingly diſtinct. It is thus deſcribed in the Repertory of Arts and Manufactures: For a nocturnal telegraph, let there be four large patent reflectors, lying on the ſame plane, parallel to the horizon, placed on the top of an obſervatory. Let each of theſe reflectors be capable, by means of two winches, either of elevation or depreſſion to a certain degree. By elevating or depreſſing one or two of the reflectors, eighteen very diſtinct arrangements may be produced, as the following ſcheme will explain (A). Vol. I. P. 382.

For the ſake of example, the above arrangements are made to anſwer to the moſt neceſſary letters of the alphabet; but alterations may be made at will, and a greater number of changes produced, without any addition to the reflectors. In the firſt obſervatory there need only be a ſet of *ſingle* reflectors; but in the others each reflector ſhould be double, ſo as to face both the preceding and ſubſequent obſervatory; and each obſervatory ſhould be furniſhed with two teleſcopes. The proper diameter of the reflectors, and their diſtance from each other, will be aſcertained by experience.

To convert this machine into a diurnal telegraph, nothing more is neceſſary than to inſert, in the place of the reflectors, gilt balls, or any other conſpicuous bodies.

Were telegraphs brought to ſo great a degree of perfection, that they could convey information ſpeedily and diſtinctly; were they ſo much ſimplified, that they could be conſtructed and maintained at little expence—the advantages which would reſult from their uſe are almoſt inconceivable. Not to ſpeak of the ſpeed with which information could be communicated and orders given in time of war, by means of which miſfortunes might be prevented or inſtantly repaired, difficulties removed, and diſputes precluded, and by means of which the whole kingdom could be prepared in an inſtant to oppoſe an invading

(A) Each reflector, after every arrangement, muſt be reſtored to its place.

Telegraph, Telemachus.

invading enemy; it might be used by commercial men to convey a commission cheaper and speadier than an express can travel. The capitals of distant nations might be united by chains of posts, and the settling of those disputes which at present take up months or years might then be accomplished in as many hours. An establishment of telegraphs might then be made like that of the post; and instead of being an expence, it would produce a revenue. Until telegraphs are employed to convey information that occurs very frequently, the persons who are stationed to work them will never become expert, and consequently will neither be expeditious nor accurate, though, with practice, there is no doubt but they will attain both in a degree of perfection of which we can as yet have but little conception.

Various other improvements of the telegraph might have been mentioned, but our limits do not permit us to dwell longer on the subject.

TELEMACHUS, the son of Ulysses and Penelope, was still in the cradle when his father went with the rest of the Greeks to the Trojan war. At the end of this celebrated war, Telemachus, anxious to see his father, went to seek him; and as the place of his residence, and the cause of his long absence, were then unknown, he visited the court of Menelaus and Nestor to obtain information. He afterwards returned to Ithaca, where the suitors of his mother Penelope had conspired to murder him, but he avoided their snares; and by means of Minerva he discovered his father, who had arrived in the island two days before him, and was then in the house of Eumæus. With this faithful servant and Ulysses Telemachus concerted how to deliver his mother from the importunities of her suitors, and it was effected with great success. After the death of his father, Telemachus went to the island of Ærea, where he married Circe, or, according to others, Cassiphone the daughter of Circe, by whom he had a son called *Latinus*. He some time after had the misfortune to kill his mother-in-law Circe, and fled to Italy, where he founded Clusium. Telemachus was accompanied in his visit to Nestor and Menelaus by the goddess of wisdom under the form of Mentor. It is said that, when a child, Telemachus fell into the sea, and that a dolphin brought him safe to shore, after he had remained some time under water. From this circumstance Ulysses had the figure of a dolphin engraved on the seal which he wore on his ring.

From these stories, collected from Homer and the other poets of antiquity, the celebrated Fenelon, archbishop of Cambray, took the idea of his well-known *Adventures of Telemachus*; which, though not composed in verse, is justly intitled to be esteemed a poem.

Lectures on Rhetoric and the Belles Lettres.

"The plan of the work (says Dr Blair) is in general well contrived; and is deficient neither in epic grandeur nor unity of object. The author has entered with much felicity into the spirit and ideas of the ancient poets, particularly into the ancient mythology, which retains more dignity, and makes a better figure in his hands than in those of any other modern poet. His descriptions are rich and beautiful; especially of the softer and calmer scenes, for which the genius of Fenelon was best suited; such as the incidents of pastoral life, the pleasures of virtue, or a country flourishing in peace. There is an inimitable sweetness and tenderness in several of the pictures of this kind which he has given;" and his measured prose, which is remarkably harmonious, gives the style nearly as much elevation as the French language is capable of supporting even in regular verse.

Telemachus || Telescope.

According to the same eminent critic, "the best executed part of the work is the first six books, in which Telemachus recounts his adventures to Calypso. The narration throughout them is lively and interesting. Afterwards, especially in the last 12 books, it becomes more tedious and languid; and in the warlike adventures which are attempted, there is a great defect of vigour. The chief objection against this work being classed with epic poems, arises from the minute details of virtuous policy, into which the author in some places enters; and from the discourses and instructions of Mentor, which recur upon us too often, and too much in the strain of common-place morality. Though these were well suited to the main design of the author, which was to form the mind of a young prince, yet they seem not congruous to the nature of epic poetry; the object of which is to improve us by means of actions, characters, and sentiments, rather than by delivering professed and formal instruction."

TELEPHIUM, True Orpine, a genus of plants belonging to the class pentandria; and in the natural system ranging under the 54th order, *Miscellaneæ*. See Botany *Index*.

TELESCOPE, an optical instrument for viewing distant objects; so named by compounding the Greek words τηλη *far off*, and σκοπεω *I look at* or *contemplate*. This name is commonly appropriated to the larger sizes of the instrument, while the smaller are called perspective-glasses, spy-glasses, opera-glasses. A particular kind, which is thought to be much brighter than the rest, is called a night-glass.

To what has been said already with respect to the inventor of this most noble and useful instrument in the article Optics, we may add the two following claims.

Mr Leonhard Digges, a gentleman of the 17th century of great and various knowledge, positively asserts in his *Stratioticos*, and in another work, that his father, a military gentleman, had an instrument which he used in the field, by which he could bring distant objects near, and could know a man at the distance of three miles. He says, that when his father was at home he had often looked through it, and could distinguish the waving of the trees on the opposite side of the Severn. Mr Digges resided in the neighbourhood of Bristol.

Francis Fontana, in his *Celestial Observations*, published at Naples in 1646, says, that he was assured by a Mr Hardy, advocate of the parliament of Paris, a person of great learning and undoubted integrity, that on the death of his father, there was found among his things an old tube, by which distant objects were distinctly seen; and that it was of a date long prior to the telescope lately invented, and had been kept by him as a secret.

It is not at all improbable, that curious people, handling spectacle glasses, of which there were by this time great varieties, both convex and concave, and amusing themselves with their magnifying power and the singular effects which they produced in the appearances of things, might sometimes chance so to place them as to produce distinct and enlarged vision. We know perfectly, from the table and scheme which Sirturus has given us of the tools or dishes in which the spectacle-makers

makers fashioned their glasses, that they had convex lenses formed to spheres of 24 inches diameter, and of 11 inferior sizes. He has given us a scheme of a set which he got leave to measure, belonging to a spectacle-maker of the name of *Rogette* at Corunna in Spain; and he says that this man had tools of the same sizes for concave glasses. It also appears, that it was a general practice (of which we do not know the precise purpose) to use a convex and concave glass together. If any person should chance to put together a 24-inch convex and a 12-inch concave (wrought on both sides) at the distance of six inches, he would have distinct vision, and the object would appear of double size. Concaves of six inches were not uncommon, and one such combined with the convex of 24, at the distance of nine inches, would have distinct vision, and objects would be quadrupled in diameter. When such a thing occurred, it was natural to keep it as a curiosity, although the *rationale* of its operation was not in the least understood. We doubt not but that this happened much oftener than in these two instances. The chief wonder is, that it was not frequent, and taken notice of by some writer. It is pretty plain that Galileo's first telescope was of this kind, made up of such spectacle-glasses as he could procure; for it magnified only three times in diameter; a thing easily procured by such glasses as he could find with every spectacle-maker. And he could not but observe, in his trials of their glasses, that the deeper concaves and flatter convexes he employed, he produced the greater amplification; and then he would find himself obliged to provide a tool not used by the spectacle-makers, viz. either a much flatter tool for a convex surface, or a much smaller sphere for a concave; and, notwithstanding his telling us that it was by reflecting on the nature of refraction, and without any instruction, we are persuaded that he proceeded in this very way. His next telescope magnified but five times. Now the slightest acquaintance with the obvious laws of refraction would have directed him at once to a very small and deep concave, which would been much easier made, and have magnified more. But he groped his way with such spectacle-glasses as he could get, till he at last made tools for very flat object-glasses and very deep eye-glasses, and produced a telescope which magnified about 25 times. Sirturus saw it, and took the measures of it. He afterwards saw a scheme of it which Galileo had sent to a German prince at Inspruck, who had it drawn (that is, the circles for the tools) on a table in his gallery. The object-glass was a plano-convex, a portion of a sphere, of 24 inches diameter; the eye-glass was a double concave of two inches diameter; the focal distances were therefore 24 inches and one inch nearly. This must have been a very lucky operation, for Sirturus says it was the best telescope he had seen: and we know that it requires the very best work to produce this magnifying power with such small spheres. Telescopes continued to be made in this way for many years; and Galileo, though keenly engaged in the observation of Jupiter's satellites, being candidate for the prize held out by the Dutch for the discovery of the longitude, and therefore much interested in the advantage which a convex eye-glass would have given him, never made them of any other form. Kepler published his Dioptrics in 1611; in which he tells us, all that he or others had discovered of the law of refraction, viz. that in very small obliquities of incidence, the angle of refraction was nearly one-third of the angle of incidence. This was indeed enough to have pointed out, with sufficient exactness, the construction of every optical instrument that we are even now possessed of; for this proportionality of the angles of incidence and refraction is assumed in the construction of the optical figure for all of them; and the deviation from it is still considered as the *refinement* of the art, and was not brought to any rule till 50 years after by Huyghens, and called by him ABERRATION. Yet even the sagacious Kepler seems not to have seen the advantage of any other construction of the telescope; he just seems to acknowledge the possibility of it: and we are surprised to see writers giving him as the author of the astronomical telescope, or even as hinting at its construction. It is true, in the last proposition he shows how a telescope may be made *apparently* with a convex eye-glass: but this is only a frivolous fancy; for the eye-glass is directed to be made convex externally, and a very deep concave on the inside; so that it is, in fact, a menisicus with the concavity prevalent. In the 86th proposition, he indeed shows that it is possible so to place a convex glass behind another convex glass, that an eye shall see objects distinct, magnified, and inverted; and he speaks very sagaciously on the subject. After having said that an eye placed behind the point of union of the first glass will see an object inverted, he shows that a small part only will be seen; and then he shows that a convex glass, duly proportioned and properly placed, will show more of it. But in showing this, he speaks in a way which shows evidently that he had formed no distinct notions of the manner in which this effect would be produced, only saying vaguely that the convergency of the second glass would counteract the divergency beyond the focus of the first. Had he conceived the matter with any tolerable distinctness, after seeing the great advantage of taking in a field greater in almost any proportion, he would have eagerly catched at the thought, and enlarged on the immense improvement. Had he but drawn one figure of the progress of the rays through two convex glasses, the whole would have been open to his view.

This step, so easy and so important, was reserved for Father Scheiner, as has been already observed in the article OPTICS; and the construction of this author, together with that of Jansen, are the models on which all refracting telescopes are now constructed; and in all that relates to their magnifying power, brightness, and field of vision, they may be constructed on Kepler's principle, that the angles of refraction are in a certain given proportion to the angles of incidence.

But after Huyghens had applied his elegant geometry to the discovery of Snellius, viz. the proportionality, not of the angles, but of the sines, and had ascertained the aberrations from the foci of infinitely slender pencils, the reasons were clearly pointed out why there were such narrow limits affixed by nature to the performance of optical instruments, in consequence of the indistinctness of vision which resulted from constructions where the magnifying power, the quantity of light, or the field of vision, were extended beyond certain moderate bounds. The theory of aberrations, which that most excellent geometer established, has enabled us to diminish this indistinctness arising from any of these causes; and this diminution

Telescope. diminution is the sole aim of all the different constructions which have been contrived since the days of Galileo and Scheiner.

THE description which has been already given of the various constructions of telescopes in the article OPTICS, is sufficient for instructing the reader in the general principles of their construction, and with moderate attention will show the manner in which the rays of light proceed, in order to ensure the different circumstances of amplification, brightness, and extent of field, and even distinctness of vision, in as far as this depends on the proper intervals between the glasses. But it is insufficient for giving us a knowledge of the improvements which are aimed at in the different departures from the original constructions of Galileo and Scheiner, the advantage of the double eye-glass of Huyghens, and the quintuple eye-glass of Dollond: still more is it insufficient for showing us why the highest degrees of amplification and most extensive field cannot be obtained by the mere proportion of the focal distances of the glasses, as Kepler had taught. In short, without the Huyghenian doctrine of aberrations, neither can the curious reader learn the limits of their performance, nor the artist learn why one telescope is better than another, or in what manner to proceed to make a telescope differing in any particular from those which he servilely copies.

Although all the improvements in the construction of telescopes since the publication of Huyghens's Dioptrics have been the productions of this island, and although Dr Smith of Cambridge has given the most elegant and perspicuous account of this science that has yet appeared, we do not recollect a performance in the English language (except the Optics of Emerson) which will carry the reader beyond the mere schoolboy elements of the science, or enable a person of mathematical skill to understand or improve the construction of optical instruments. The last work on this subject of any extent (Dr Priestley's History of Vision) is merely a parlour book for the amusement of half-taught dilettanti, but is totally deficient in the mathematical part, although it is here that the science of optics has her chief claim to pre-eminence, and to the name of a DISCIPLINA ACCURATA. But this would have been *ultra crepidam;* and the author would in all probability have made as poor a figure here as he has done in his attempts to degrade his species in his Commentaries on the *Vibratiunculæ* of Hartley; motions which neither the author nor his amplificator were able to understand or explain. We trust that our readers, jealous as we are of every thing that sinks us in the scale of nature's works, will pardon this transient ejaculation of spleen, when our thoughts are called to a system which, of *absolute and unavoidable necessity*, makes the DIVINE MIND nothing but a quivering of *that matter* of which it is the AUTHOR and unerring DIRECTOR. *Sed missum faciamus.*

We think therefore that we shall do the public some service, by giving such an account of this *higher branch* of optical science as will at least tend to the complete understanding of this noble instrument, by which our conceptions of the extent of almighty power, and wisdom, and beneficence, are so wonderfully enlarged. In the prosecution of this we hope that many general rules will emerge, by which artists who are not mathematicians may be enabled to construct optical instruments with intelligence, and avoid the many blunders and defects which result from mere servile imitation. Telescope.

The general aim in the construction of a telescope is, to form, by means of mirrors or lenses, an image of the distant object, as large, as bright, and as extensive as is possible, consistently with distinctness; and then to view the image with a magnifying glass in any convenient manner. This gives us an arrangement of our subject. We shall first show the principles of construction of the object-glass or mirror, so as that it shall form an image of the distant object with these qualities; and then show how to construct the magnifying glass or eye-piece, so as to preserve them unimpaired.

This indistinctness which we wish to avoid arises from two causes; the spherical figures of the refracting and reflecting surfaces, and the different refrangibility of the differently coloured rays of light. The first may be called the SPHERICAL and the second the CHROMATIC indistinctness; and the deviations from the foci, determined by an elementary theorem, given under OPTICS, may be called the SPHERICAL and the CHROMATIC aberrations.

The limits of a Work like this will not permit us to give any more of the doctrine of aberrations than is absolutely necessary for the construction of achromatic telescopes; and we must refer the reader for a general view of the whole to Euler's *Dioptrics*, and other works of that kind. Dr Smith has given as much as was necessary for the comparison of the merits of different glasses of similar construction, and this in a very plain and elegant manner.

We shall begin with the aberration of colour, because it is the most simple.

Let white or compounded light fall perpendicularly on the flat side PQ (fig. 1.) of a plano-convex lens PVQ, whose axis is CV and vertex V. The white ray *p* P falling on the extremity of the lens is dispersed by refraction at the point P of the spherical surface, and the red ray goes to the point *r* of the axis, and the violet ray to the point *v*. In like manner the white ray *q* Q is dispersed by refraction at Q, the red ray going to *r*, and the violet to *v*. The red ray P *r* crosses the violet ray Q *v* in a point D, and Q *r* crosses P *v* in a point E; and the whole light refracted and dispersed by the circumference whose diameter is PQ, passes through the circular area, whose diameter is DE. Supposing that the lens is of such a form that it would collect red rays, refracted by its whole surface in the point *r*, and violet in the point *v*; then it is evident that the whole light which occupies the surface of the lens will pass through this little circle, whose diameter is DE. Therefore white light flowing from a point so distant that the rays may be considered as parallel, will not be collected in another point or focus, but will be dispersed over the surface of that little circle; which is therefore called the *circle of chromatic dispersion;* and the radiant point will be represented by this circle. The neighbouring points are in like manner represented by circles; and these circles encroaching on and mixing with each other, must occasion haziness or confusion, and render the picture indistinct. This indistinctness will be greater in the proportion of the number of circles which are in this manner mixed together. This will be in the proportion of the room that is for them; that is, in proportion to the area of the circle, or in the duplicate proportion Plate DXXVIII. Fig. 1.

Telescope. tion of its diameter. Our first business therefore is, to obtain measures of this diameter, and to mark the connection between it and the aperture and focal distance of the lens.

Let i be to r as the sine of incidence in glass to the sine of refraction of the red rays; and let i be to v as the sine of incidence to the sine of refraction of the violet rays. Then we say, that when the aperture PQ is moderate, $v-r : v+r-2i = DE : PQ$, very nearly. For let DE, which is evidently perpendicular to V r, meet the parallel incident rays in K and L and the radii of the spherical surface in G and H. It is plain that GPK is equal to the angle of incidence on the posterior or spherical surface of the lens; and GP r and GP v are the angles of the refraction of the red and the violet rays; and that GK, GD, and GE, are very nearly as the sines of those angles, because the angles are supposed to be small. We may therefore institute this proportion $DE : KD = v-r : r-i$; then, by doubling the consequents $DE : 2KD = v-r : 2r-2i$. Also $DE : 2KD + DE = v-r : 2r-2i+v-r, = v-r : r+v-2i$. But $2KD + DE$ is equal to KL or PQ. Therefore we have $DE : PQ = v-r : r+v-2i$. *Q. E. D.*

Cor. 1. Sir Isaac Newton, by most accurate observation, found, that in common glass the sines of refraction of the red and violet rays were 77 and 78 where the sine of incidence was 50. Hence it follows, that $v-r$ is to $v+r-2i$ as 1 to 55; and that the diameter of the smallest circle of dispersion is $\frac{1}{55}$th part of that of the lens.

2. In like manner may be determined the circle of dispersion that will comprehend the rays of any particular colour or set of colours. Thus all the orange and yellow will pass through a circle whose diameter is $\frac{1}{260}$th of that of the lens.

3. In different surfaces, or plano-convex lenses, the angles of aberration $r P v$ are as the breadth PQ directly, and as the focal distance VF inversely; because any angle DPE is as its subtense DE directly and radius DP inversely. N. B. We call VF the focal distance, because at this distance, or at the point F, the light is most of all constipated. If we examine the focal distance by holding the lens to the sun, we judge it to be where the light is drawn into the smallest spot.

When we reflect that a lens of $5\frac{1}{2}$ inches in diameter has a circle of dispersion $\frac{1}{10}$th of an inch in diameter, we are surprised that it produces any picture of an object that can be distinguished. We should not expect greater distinctness from such a lens than would be produced in a camera obscura without a lens, by simply admitting the light through a hole of $\frac{1}{10}$th of an inch in diameter. This, we know, would be very hazy and confused. But when we remark the superior vivacity of the yellow and orange light in comparison with the rest, we may believe that the effect produced by the confusion of the other colours will be much less sensible. But a stronger reason is, that the light is much denser in the middle of the circle of dispersion, and is exceedingly faint towards the margin. This, however, must not be taken for granted; and we must know distinctly the manner in which the light of different colours is distributed over the circle of chromatic dispersion, before we pretend to pronounce on the immense difference between the indistinctness arising from colour and that arising from the spherical figure. We think this the more necessary, because the illustrious discoverer of the chromatic aberration has made a great mistake in the comparison, because he did not consider the distribution of the light in the circle of spherical dispersion. It is therefore proper to investigate the chromatic distribution of the light with the same care that we bestowed on the spherical dispersion in OPTICS, and we shall then see that the superiority of the reflecting telescope is incomparably less than Newton imagined it to be.

Therefore let EB (fig. 2.) represent a plano-convex lens, of which C is the centre and C r the axis. Let us suppose it to have no spherical aberration, but to collect rays occupying its whole surface to single points in the axis. Let a beam of white or compounded light fall perpendicularly on its plane surface. The rays will be so refracted by its curved surface, that the extreme red rays will be collected at r, the extreme violent rays at w, and those of intermediate refrangibility at intermediate points, o, y, g, b, p, v, of the line $r w$, which is nearly $\frac{1}{28}$th of r C. The extreme red and violet rays will cross each other at A and D; and AD will be a section or diameter of the circle of chromatic dispersion, and will be about $\frac{1}{55}$th of EB. We may suppose $w r$ to be bisected in b, because $w b$ is to $b r$ very nearly in the ratio of equality (for $r b : r C = b A : c E, = b A : c B, = w b : w C$). The line $r w$ will be a kind of prismatic spectrum, red from r to o, orange-coloured from o to y, yellow from y to g, green from g to b, blue from b to p, purple from p to v, and violet from v to w. Fig. 2.

The light in its compound state must be supposed uniformly dense as it falls upon the lens; and the same must be said of the rays of any particular colour. Newton supposes also, that when a white ray, such as e E, is dispersed into its component coloured rays by refraction at E, it is uniformly spread over the angle DEA. This supposition is indeed gratuitous; but we have no argument to the contrary, and may therefore consider it as just. The consequence is, that each point w, v, p, b, &c. of the spectrum is not only equally luminous, but also illuminates uniformly its corresponding portion of AD: that is to say, the coating (so to term it) of any particular colour, such as purple, from the point p, is uniformly dense in every part of AD on which it falls. In like manner, the colouring of yellow, intercepted by a part of AD in its passage to the point y, is uniformly dense in all its parts. But the density of the different colours in AD is extremely different: for since the radiation in w is equally dense with that in p, the density of the violet colouring, which radiates from w, and is spread over the whole of AD, must be much less than the density of the purple colouring, which radiates from p, and occupies only a part of AD round the circle b. These densities must be very nearly in the inverse proportion of $w b^2$ to $p b^2$.

Hence we see, that the central point b will be very intensely illuminated by the blue radiating from $p b$ and the green intercepted from $b g$. It will be more faintly illuminated by the purple radiating from $v p$, and the yellow intercepted from $g y$; and still more faintly by the violet from $w v$, and the orange and red intercepted from $y r$. The whole colouring will be a white, tending a little to yellowness. The accurate proportion of these

Telescope. these colourings may be computed from our knowledge of the position of the points o, y, g, &c. But this is of little moment. It is of more consequence to be able to determine the proportion of the total intensity of the light in b to its intensity in any other point I.

For this purpose draw r IR, I w W, meeting the lens in R and W. The point I receives none of the light which passes through the space RW: for it is evident that b I : CR $= b$ A : CE, $= 1 : 55$, and that CR $=$ CW; and therefore, since all the light incident on EB passes through AB, all the light incident on RW passes through I i ($b\,i$ being made $= b$ I). Draw o IO, y IY, g IG, I p P, I v V. It is plain, that I receives red light from RO, orange from OY, yellow from YG, green from GE, a little blue from BP, purple from PV, and violet from VW. It therefore wants some of the green and of the blue.

That we may judge of the intensity of these colours at I, suppose the lens covered with paper pierced with a small hole at G. The green light only will pass through I; the other colours will pass between I and b, or between I and A, according as they are more or less refrangible than the particular green at I. This particular colour converges to g, and therefore will illuminate a small spot round I, where it will be as much denser than it is at G as this spot is smaller than the hole at G. The natural density at G, therefore, will be to the increased density at I, as $g\,I^2$ to $g\,G^2$, or as $g\,b^2$ to $g\,C^2$, or as $b\,I^2$ to CG^2. In like manner, the natural density of the purple coming to I through an equal hole at P will be to the increased density at I as $b\,I^2$ to CP^2. And thus it appears, that the intensity of the differently coloured illuminations of *any* point of the circle of dispersion, is inversely proportional to the square of the distance from the centre of the lens to the point of its surface through which the colouring light comes to this point of the circle of dispersion. This circumstance will gives us a very easy, and, we think, an elegant solution of the question.

Bisect CE in F, and draw FL perpendicular to CE, making it equal to CF. Through the point L describe the hyperbola KLN of the second order, that is, having the ordinates EK, FL, RN, &c. inversely proportional to the squares of the abscissæ CE, CF, CR, &c.; so that FL : RN $= \frac{1}{CF^2} : \frac{1}{CR^2}$, or $= CR^2 : CF^2$, &c. It is evident that these ordinates are proportional to the densities of the severally coloured lights which go from them to any points whatever of the circle of dispersion.

Now the total density of the light at I depends both on the density of each particular colour and on the number of colours which fall on it. The ordinates of this hyperbola determine the first; and the space ER measures the number of colours which fall on I, because it receives light from the whole of ER, and of its equal BW. Therefore, if ordinates be drawn from any point of ER, their sum will be as the whole light which goes to I; that is, the total density of the light at I will be proportional to the area NREK. Now it is known that CE $\times$ EK is equal to the infinitely extended area lying beyond EK; and CR $\times$ RN is equal to the infinitely extended area lying beyond RN. Therefore the area NREK is equal to CR $\times$ RN—CE $\times$ EK. But RN and EK are respectively equal to $\frac{CF^3}{CR^2}$ and $\frac{CF^3}{CE^2}$. Therefore the density at I is proportional to $CF^3 \times \left(\frac{CR}{CR^2} - \frac{CE}{CE^2}\right), = CF^3 \times \left(\frac{1}{CR} - \frac{1}{CE}\right), = CF^3 \times \frac{CE - CR}{CE \times CR}, = CF^3 \times \frac{ER}{CE \times CR}, = \frac{CF^3}{CE} \times \frac{ER}{CR}$. But because CF is $\frac{1}{2}$ of CE, $\frac{CF^3}{CE}$ is $= \frac{CF^3}{2\,CF}, = \frac{CF^2}{2}$, a constant quantity. Therefore the density of the light at I is proportional to $\frac{ER}{CR}$, or to $\frac{AI}{b\,I}$, because the points R and I are similarly situated in EC and A b.

Farther, if the semiaperture CE of the lens be called 1, $\frac{CF^2}{2}$ is $= \frac{1}{8}$, and the density at I is $= \frac{AI}{8\,b\,I}$.

Here it is proper to observe, that since the point R has the same situation in the diameter EB that the point I has in the diameter AD of the circle of dispersion, the circle described on EB may be conceived as the magnified representation of the circle of dispersion. The point F, for instance, represents the point f in the circle of dispersion, which bisects the radius b A; and f receives no light from any part of the lens which is nearer the centre than F, being illuminated only by the light which comes through EF and its opposite BF′. The same may be said of every other point.

In like manner, the density of the light in f, the middle between b and A, is measured by $\frac{EF}{CF}$, which is $= \frac{EF}{EF}$, or 1. This makes the density at this point a proper standard of comparison. The density there is to the density at I as 1 to $\frac{AI}{b\,I}$, or as b I to AI; and this is the simplest mode of comparison. The density half way from the centre of the circle of dispersion is to the density at any point I as b I to IA.

Lastly, through L describe the common rectangular hyperbola k L n, meeting the ordinates of the former in k, L, and n: and draw $k\,h$ parallel to EC, cutting the ordinates in g, f, r, &c. Then CR : CE $=$ E k : R n, and CR : CE—CR $=$ E k : R n—E k, or CR : RE $=$ E k : $r\,n$, and b I : IA $=$ E k : $r\,n$. And thus we have a very simple expression of the density in any point of the circle of dispersion. Let the point be anywhere, as at I. Divide the lens in R as AD is divided in I, and then $r\,n$ is as the density in I.

These two measures were given by Newton; the first in his *Treatise de Mundi Systemate*, and the last in his *Optics*; but both without demonstration.

If the hyperbola k L n be made to revolve round the axis CQ, it will generate a solid spindle, which will measure the whole quantity of light which passes through different portions of the circle of dispersion. Thus the solid produced by the revolution of L $k\,f$ will measure all the light which occupies the outer part of the circle of dispersion lying without the middle of the radius. This space is $\frac{3}{4}$ths of the whole circle; but the quantity of light is but $\frac{1}{4}$th of the whole.

Telescope. A still more simple expression of the whole quantity of light passing through different portions of the circle of chromatic dispersion may now be obtained as follows:

It has been demonstrated, that the density of the light at I is as $\frac{AI}{bI}$, or as $\frac{ER}{CR}$. Suppose the figure to turn round the axis. I or R describe circumferences of circles; and the whole light passing through this circumference is as the circumference, or as the radius, and as the density jointly. It is therefore as $\frac{ER}{CR} \times CR$, that is, as ER. Draw any straight line E m, cutting RN in s, and any other ordinate FL in x R s. The whole light which illuminates the circumference described by I is to the whole light which illuminates the centre b as ER to EC, or as R s to C m. In like manner, the whole light which illuminates the circumference described by the point f in the circle of dispersion is to the whole light which illuminates the centre b, as F x to C m. The lines C m, RS, Fx, are therefore proportional to the whole light which illuminates the corresponding circumferences in the circle of dispersion. Therefore the whole light which falls on the circle whose radius is bI, will be represented by the trapezium in CRS; and the whole light which falls on the ring described by IA, will be represented by the triangle E s R; and so of any other portions.

By considering the figure, we see that the distribution of the light is exceedingly unequal. Round the margin it has no sensible density; while its density in the very centre is incomparably greater than in any other point, being expressed by the asymptote of a hyperbola. Also the circle described with the radius $\frac{Ab}{2}$ contains $\frac{3}{4}$ths of the whole light. No wonder then that the confusion caused by the mixture of these circles of dispersion is less than one should expect; besides, it is evident that the most lively or impressive colours occupy the middle of the spectrum, and are there much denser than the rest. The margin is covered with an illumination of deep red and violet, neither of which colours are brilliant. The margin will be of a dark claret colour. The centre revives all the colours, but in a proportion of intensity greatly different from that in the common prismatic spectrum, because the radiant points L, p, b, g, &c. by which it is illuminated, are at such different distances from it. It will be white; but we apprehend not a pure white, being greatly overcharged with the middle colours.

These considerations show that the coloured fringes, which are observed to border very luminous objects seen on a dark ground through optical instruments, do not proceed from the object-glass of a telescope or microscope, but from an improper construction of the eye-glasses. The chromatic dispersion would produce fringes of a different colour, when they produce any at all, and the colours would be differently disposed. But this dispersion by the object-glass can hardly produce any fringes: its effect is a general and almost uniform mixture of circles all over the field, which produces an uniform haziness, as if the object were viewed at an improper distance, or out of its focus, as we vulgarly express it.

We may at present form a good guess at the limit which this cause puts to the performance of a telescope. A point of a very distant object is represented, in the picture formed by the object-glass, by a little circle, whose diameter is at least $\frac{1}{300}$th of the aperture of the object-glass, making a very full allowance for the superior brilliancy and density of the central light. We look at this picture with a magnifying eye-glass. This magnifies the picture of the point. If it amplify it to such a degree as to make it an object individually distinguishable, the confusion is then sensible. Now this can be computed. An object subtending one minute of a degree is distinguished by the dullest eye, even although it be a dark object on a bright ground. Let us therefore suppose a telescope, the object-glass of which is of six feet focal distance, and one inch aperture. The diameter of the circle of chromatic dispersion will be $\frac{1}{300}$th of an inch, which subtends at the centre of the object-glass an angle of about $9\frac{1}{2}$ seconds. This, when magnified six times by an eye-glass, would become a distinguishable object; and a telescope of this length would be indistinct if it magnified more than six times, if a point were thus spread out into a spot of uniform intensity. But the spot is much less intense about its margin. It is found experimentally that a piece of engraving, having fine cross hatches, is not sensibly indistinct till brought so far from the limits of perfectly distinct vision, that this indistinctness amounts to 6′ or 5′ in breadth.—Therefore such a telescope will be sensibly distinct when it magnifies 36 times; and this is very agreeable to experience.

We come, in the second place, to the more arduous task of ascertaining the error arising from the spherical figure of the surfaces employed in optical instruments. —Suffice it to say, before we begin, that although geometers have exhibited other forms of lenses which are totally exempt from this error, they cannot be executed by the artist; and we are therefore restricted to the employment of spherical surfaces.

Of all the determinations which have been given of spherical aberration, that by Dr Smith, in his Optics, which is an improvement of the fundamental theorem of that most elegant geometer Huyghens, is the most perspicuous and palpable. Some others are more concise, and much better fitted for after use, and will therefore be employed by us in the prosecution of this article. But they do not keep in view the optical facts, giving the mind a picture of the progress of the rays, which it can contemplate and discover amidst many modifying circumstances. By ingenious substitutions of analytical symbols, the investigation is rendered expeditious, concise, and certain; but these are not immediate symbols of things, but of operations of the mind; objects sufficiently subtile of themselves, and having no need of substitutions to make us lose sight of the real subject; and thus our occupation degenerates into a process almost without ideas. We shall therefore set out with Dr Smith's fundamental Theorem.

1. *In Reflections.*

Let AVB (fig. 3.) be a concave spherical mirror, of which C is the centre, V the vertex, CV the axis, and F the focus of an infinitely slender pencil of parallel rays passing Fig. 3.

Telescope. passing through the centre. Let the ray a A, parallel to the axis, be reflected in AG, crossing the central ray CV in f. Let AP be the sine of the semi-aperture AV, AD its tangent, and CD its secant.

The aberration Ff from the principal focus of central rays is equal to $\frac{1}{2}$ of the excess VD of the secant above the radius, or very near equal to $\frac{1}{2}$ of VP, the versed sine of the semi-aperture.

For because AD is perpendicular to CA, the points C, A, D, are in a circle, of which CD is the diameter; and because Af is equal to Cf, by reason of the equality of the angles fAC, fCA, and CA a, f is the centre of the circle through C, A, D, and fD is $= \frac{1}{2}$ CD. But FC is $= \frac{1}{2}$ CV. Therefore Ff is $\frac{1}{2}$ of VD.

But because DV : VP = DC : VC, and DC is very little greater than VC when the aperture AB is moderate, DV is very little greater than VP, and Ff is very nearly equal to $\frac{1}{2}$ of VP.

Cor. 1. The longitudinal aberration is $= \frac{AV^2}{4CV}$, for PV is very nearly $= \frac{AV^2}{2CV}$.

Cor. 2. The lateral aberration FG is $= \frac{AV^3}{2CV^2}$. For FG : Ff = AP : Pf, = AV : $\frac{1}{2}$ CV nearly, and therefore FG $= \frac{AV^3}{4CV} \times \frac{2}{CV} = \frac{AV^3}{2CV^2}$.

2. *In Refractions.*

Fig. 4. or 5. Let AVB (fig. 4. or 5.) be a spherical surface separating two refracting substances, C the centre, V the vertex, AV the semi-aperture, AP its sine, PV its versed sine, and F the focus of parallel rays infinitely near to the axis. Let the extreme ray a A, parallel to the axis, be refracted into AG, crossing CF in f, which is therefore the focus of extreme parallel rays.

The rectangle of the sine of incidence, by the difference of the sines of incidence and refraction, is to the square of the sine of refraction, as the versed sine of the semi-aperture is to the longitudinal aberration of the extreme rays.

Call the sine of incidence i, the sine of refraction r, and their difference d.

Join CA, and about the centre f describe the arch AD.

The angle ACV is equal to the angle of incidence, and CAf is the angle of refraction. Then, since the sine of incidence is to the sine of refraction as VF to CF, or as Af to Cf, that is, as Df to Cf, we have

CF : FV = Cf : fD

by conversion CF : CV = Cf : CD

altern. conver. CF—Cf : CV—CD = CF : CV

or - Ff : VD = CF : CV, $= r : d$.

Now PV $= \frac{AP^2}{CP+CV}, = \frac{AP^2}{2CV}$ nearly, and PD $= \frac{AP^2}{fP+fV} = \frac{AP^2}{2fV}$ nearly, $= \frac{AP^2}{2FV}$ nearly. Therefore PV : PD = FV : CV, and DV : PV = CF : FV nearly.

We had above Ff : VD = $r : d$;

and now - VD : PV = CF : FV, $= r : i$;

therefore - Ff : PV = $r^2 : di$,

and Ff $= \frac{r^2}{di} \times$ PV. Q. E. D.

The aberration will be different according as the refraction is made towards or from the perpendicular; that is, according as r is less or greater than i. They are in the ratio of $\frac{r^2}{di}$ to $\frac{i^2}{dr}$, or of r^3 to i^3. The aberration therefore is always much diminished when the refraction is made from a rare into a dense medium. The proportion of the sines for air and glass is nearly that of 3 to 2. When the light is refracted into the glass, the aberration is nearly $\frac{4}{3}$ of PV; and when the light passes out of glass into air, it is about $\frac{8}{2}$ of PV.

Cor. 1. Ff $= \frac{r^2}{di} \times \frac{AP^2}{2CV}$ nearly, and it is also $= \frac{r^2}{d^2} \times \frac{AP^2}{2FV}$, because PV $= \frac{AP^2}{2CV}$ nearly, and $i : d$ = FV : CV.

Cor. 2. Because fP : PA = Ff : FG

or FV : AV = Ff : FG nearly,

we have FG, the lateral aberration, $=$ Ff $\times \frac{AV}{FV}, = \frac{r^2}{d^2} \times \frac{AV^3}{2FV^2}, = \frac{r^2}{i^2} \times \frac{AV^3}{2CV^2}$.

Cor. 3. Because the angle FAf is proportional to $\frac{FG}{FV}$ very nearly, we have the angular aberration FAf $= \frac{r^2}{d^2} \times \frac{AV^3}{2FV^3} = \frac{r^2}{i^2} \times \frac{AV^3}{2CV^3}$.

In general, the longitudinal aberrations from the focus of central parallel rays are as the squares of the apertures directly, and as the focal distances inversely; and the lateral aberrations are as the cubes of the apertures directly, and the squares of the focal distances inversely; and the angular aberrations are as the cubes of the aperture directly, and the cubes of the focal distances inversely.

The reader must have observed, that to simplify the investigation, some small errors are admitted. PV and PD are not in the exact proportion that we assumed them, nor is Df equal to FV. But in the small apertures which suffice for optical instruments, these errors may be disregarded.

This spherical aberration produces an indistinctness of vision, in the same manner as the chromatic aberration does, viz. by spreading out every mathematical point of the object into a little spot in its picture; which spots, by mixing with each other, confuse the whole. We must now determine the diameter of the circle of diffusion, as we did in the case of chromatic dispersion.

Plate DXXIX. Fig. 6. Let a ray $\beta\alpha$ (fig. 6.) be refracted on the other side of the axis, into αHφ, cutting AfG in H, and draw the perpendicular EH. Call AVa, αVα, Vf (or VF, or Vφ, which in this comparison may be taken as equal) $= f$, Ff $= b$, and fE $= \varphi x$.

AV^2 : αV^2 = Ff : Fφ (already demonstrated) and Fφ $= \frac{\alpha^2}{a^2} b$, and Ff—Fφ, (or $f\varphi$) $= b - \frac{\alpha^2}{a^2} b, = \frac{a^2 b - \alpha^2 b}{a^2}$, $= \frac{b}{a^2} \times a^2 - \alpha^2, = \frac{b}{a^2} \times \overline{a+\alpha} \times \overline{a-\alpha}$. Also P$f$: PA

$= f$E

$= fE : EH$, or $f : a = x : \frac{ax}{f}, = EH$. And $P\pi : P\varphi = EH : E\varphi$, or $\alpha : f = \frac{ax}{f} : \frac{ax}{\alpha}, = E\varphi$. Therefore $f\varphi = \frac{ax}{\alpha} + x, = \frac{\overline{a+\alpha}x}{\alpha}, = \frac{x}{\alpha} \times \overline{a+\alpha}$. Therefore $\frac{x}{\alpha} \times \overline{a+\alpha} = \frac{b}{a^2} \times \overline{a+\alpha} \times \overline{a-\alpha}$, and $\frac{x}{\alpha} = \frac{b}{a^2} \times \overline{a-\alpha}$, and $x = \frac{b}{a^2} \times \alpha(a-\alpha)$. Therefore x is greatest when $\alpha \times \overline{a-\alpha}$ is greatest; that is, when $\alpha = \frac{1}{2}a$. Therefore EH is greatest when $P\pi$ is equal to the half of AP. When this is the case, we have at the same time $\frac{b}{a^2} \times \alpha(a-\alpha) = \frac{b}{a^2} \times \frac{1}{4}a^2$, and $x = \frac{1}{4}b$, or $EH = \frac{1}{4}FG$. That is, the diameter of the circle of aberration through which the whole of the refracted light must pass, is $\frac{1}{4}$ of the diameter of the circle of aberration at the focus of parallel central rays. In the chromatic aberration it was $\frac{1}{2}$; so that in this respect the spherical aberration does not create so great confusion as the chromatic.

We are now able to compare them, since we have now the measure of both the circles of aberration.

It has not been found possible to give more than four inches of aperture to an object glass of 100 feet focal distance, so as to preserve sufficient distinctness. If we compute the diameter of the circle EH corresponding to this aperture, we shall find it not much to exceed $\frac{1}{120{,}000}$ of an inch. If we restrict the circle of chromatic dispersion to $\frac{1}{250}$ of the aperture, which is hardly the fifth part of the whole dispersion in it, it is $\frac{1}{62\frac{1}{2}}$ of an inch, and is about 1900 times greater than the other.

The circle of spherical aberration of a plano-convex lens, with the plane side next the distant object, is equal to the circle of chromatic dispersion when the semi-aperture is about 15°: For we saw formerly that EH is $\frac{1}{4}$ of FG, and that FG is $= \frac{r^2}{i^2} \frac{AP^3}{2AC^2}$, and therefore $EG = \frac{r^2}{i^2} \times \frac{AP^3}{8AC^2}$. This being made $= \frac{AP}{55}$, gives us $AP = \sqrt{\frac{8i^2AC^2}{55r^2}}$, which is nearly $\frac{AC}{4}$, and corresponds to an aperture of 30° diameter, if r be to i as 3 to 2.

Sir Isaac Newton was therefore well entitled to say, that it was quite needless to attempt figures which should have less aberration than spherical ones, while the confusion produced by the chromatic dispersion remained uncorrected. Since the indistinctness is as the squares of the diameters of the circles of aberration, the disproportion is quite beyond our imagination, even when Newton has made such a liberal allowance to the chromatic dispersion. But it must be acknowledged, that he has not attended to the distribution of the light in the circle of spherical aberration, and has hastily supposed it to be like the distribution of the coloured light, indefinitely rare in the margin, and denser in the centre.

We are indebted to Father Boscovich for the elegant determination of this distribution, which we have given in the article OPTICS. From this it appears, that the light in the margin of the circle of spherical aberration, instead of being incomparably rarer than in the spaces between it and the centre, is incomparably denser. The indistinctness therefore produced by the intersection of these luminous circumferences is vastly great, and increases the whole indistinctness exceedingly. By a gross calculation which we made, it appears to be increased at least 500 times. The proportional indistinctness therefore, instead of being 1900^2 to 1, is only $\frac{1900^2}{500}$, or nearly 7220 to 1; a proportion still sufficiently great to warrant Newton's preference of the reflecting telescope of his invention. And we may now observe, that the reflecting telescope has even a great advantage over a refracting one of the same focal distance, with respect to its spherical aberration: For we have seen (*Cor.* 2.) that the lateral aberration is $\frac{r^2}{i^2} \frac{AV^3}{2CV^2}$. This for a plano-convex glass is nearly $\frac{9}{4} \frac{AV^3}{2CV^2}$. And the diameter of the circle of aberration is one-fourth of this, or $\frac{9}{16} \times \frac{AV^3}{2CV^2}$. In like manner, the lateral aberration of a concave mirror is $\frac{AV^3}{2CV^2}$; and the diameter of the circle of dispersion is $\frac{AV^3}{8CV^2}$; and therefore if the surfaces were portions of the same sphere, the diameter of the circle of aberration of refracted rays would be to that of the circle of aberration of reflected rays as $\frac{9}{16}$ to $\frac{1}{4}$, or as 9 to 4. But when the refracting and reflecting surfaces, in the position here considered, have the same focal distance, the radius of the refracting surface is four times that of the reflecting surface. The proportion of the diameters of the circles of spherical aberration is that of 9×4^2 to 4, or of 144 to 4, or 36 to 1. The distinctness therefore of the reflector is 36×36, or 1296 times greater than that of a plano-convex lens (placed with the plane side next the distant object) of the same breadth and focal distance, and will therefore admit of a much greater magnifying power. This comparison is indeed made in circumstances most favourable to the reflector, because this is the very worst position of a plano-convex lens. But we have not as yet learned the aberration in any other position. In another position the refraction and consequent aberration of both surfaces are complicated.

Before we proceed to the consideration of this very difficult subject, we may deduce from what has been already demonstrated several general rules and maxims in the construction of telescopes, which will explain (to such readers as do not wish to enter more deeply into the subject), and justify the proportion which long practice of the best artists has sanctioned.

Indistinctness proceeds from the commixture of the circles of aberration on the retina of the eye: For any one *sensible* point of the retina, being the centre of a circle of aberration, will at once be affected by the admixture of the rays of as many different pencils of light as there are sensible points in the area of that circle, and will convey to the mind a mixed sensation of as many visible

Telescope. visible points of the object. This number will be as the area of the circle of aberrations, whatever be the size of a sensible point of the retina. Now in vision with telescopes, the diameter of the circle of aberration on the retina is as the *apparent* magnitude of the diameter of the corresponding circle in the focus of the eye-glass; that is, as the angle subtended by this diameter at the centre of the eye-glass; that is, as the diameter itself directly, and as the focal distance of the eye-glass inversely. And the area of that circle on the retina is as the area of the circle in the focus of the eye-glass directly, and as the square of the focal distance of the eye-glass inversely. And this is the measure of the apparent indistinctness.

Cor. In all sorts of telescopes, and also in compound microscopes, an object is seen equally distinct when the focal distances of the eye-glasses are proportional to the diameters of the circles of aberration in the focus of the object-glass.

Here we do not consider the trifling alteration which well constructed eye-glasses may add to the indistinctness of the first image.

In refracting telescopes, the apparent indistinctness is as the area of the object-glass directly, and as the square of the focal distance of the eye-glass inversely. For it has been shown, that the area of the circle of dispersion is as the area of the object-glass, and that the spherical aberration is insignificant when compared with this.

Therefore, to make reflecting telescopes equally distinct, the diameter of the object-glass must be proportional to the focal distance of the eye-glass.

But in reflecting telescopes, the indistinctness is as the sixth power of the aperture of the object-glass directly, and as the fourth power of the focal distance of the object-glass and square of the focal distance of the eye-glass inversely. This is evident from the dimensions of the circle of aberration, which was found proportional to $\frac{AV^3}{CV^2}$.

Therefore, to have them equally distinct, the cubes of the apertures must be proportional to the squares of the focal distance multiplied by the focal distance of the eye-glass.

By these rules, and a standard telescope of approved goodness, an artist can always proportion the parts of any instrument he wishes to construct. Mr Huyghens made one, of which the object-glass had 30 feet focal distance and three inches diameter. The eye-glass had 3.3 inches focal distance. And its performance was found superior to any which he had seen; nor did this appear owing to any chance goodness of the object-glass, because he found others equally good which were constructed on similar proportions. This has therefore been adopted as a standard.

It does not at first appear how there can be any difficulty in this matter, because we can always diminish the aperture of the object-glass or speculum till the circle of aberration is as small as we please. But by diminishing this aperture, we diminish the light in the duplicate ratio of the aperture. Whatever be the aperture, the brightness is diminished by the magnifying power, which spreads the light over a greater surface in the bottom of the eye. The apparent brightness must be as the square of the aperture of the telescope directly, and the square of the amplification of the diameter of an object inversely. Objects therefore will be seen equally bright if the apertures of the telescopes be as the focal distances of the object-glasses directly, and the focal distances of the single eye-glass (or eye-glass equivalent to the eye-piece) inversely. Therefore, to have telescopes equally distinct and equally bright, we must combine these proportions with the former. It is needless to go farther into this subject, because the construction of refracting telescopes has been so materially changed by the correction of the chromatic aberration, that there can hardly be given any proportion between the object-glass and eye-glasses. Every thing now depends on the degree in which we can correct the aberrations of the object-glass. We have been able so far to diminish the chromatic aberration, that we can give very great apertures without its becoming sensible. But this is attended with so great an increase of the aberration of figure, that this last becomes a sensible quality. A lens which has 30° for its semi-aperture, has a circle of aberration equal to its chromatic aberration. Fortunately we can derive from the very method of contrary refractions, which we employ for removing the chromatic aberration, a correction of the other. We are indebted for this contrivance also to the illustrious Newton.

We call this Newton's contrivance, because he was the first who proposed a construction of an object-glass in which the aberration was corrected by the contrary aberrations of glass and water.

Huyghens had indeed supposed, that our all-wise Creator had employed in the eyes of animals many refractions in place of one, in order to make the vision more distinct; and the invidious detractors from Newton's fame have catched at this vague conjecture as an indication of his knowledge of the possibility of destroying the aberration of figure by contrary refractions. But this is very ill-founded. Huyghens has acquired sufficient reputation by his theory of aberrations. The scope of his writing in the passage alluded to, is to show that, by dividing any intended refraction into parts, and producing a certain convergence to or divergence from the axis of an optical instrument by means of two or three lenses instead of one, we diminish the aberrations four or nine times. This conjecture about the eye was therefore in the natural train of his thoughts. But he did not think of destroying the aberration altogether by opposite refractions. Newton, in 1669, says, that opticians need not trouble themselves about giving figures to their glasses other than spherical. If this figure were all the obstacle to the improvement of telescopes, he could show them a construction of an object-glass having spherical surfaces where the aberration is destroyed; and accordingly gives the construction of one composed of glass and water, in which this is done completely by means of contrary refractions.

The general principle is this: When the radiant point R (fig. 7.), or focus of incident rays, and its conjugate focus F of refracted central rays, are on opposite sides of the refracting surface or lens V, the conjugate focus f of marginal rays is nearer to R than F is. But when the focus of incident rays R′ lies on the same side with its conjugate focus F′ for central rays, R′f′ is greater than R′F′. Fig. 7.

Now fig. 8. represents the contrivance for destroying the colour produced at F, the principal focus of the convex Fig. 8.

Telescope. convex lens V, of crown glass, by means of the contrary refraction of the concave lens v of flint glass. The incident parallel rays are made to converge to F by the first lens. This convergence is diminished, but not entirely destroyed, by the concave lens v, and the focus is formed in F. F and F′ therefore are conjugate foci of the concave lens. If F be the focus of V for central rays, the marginal rays will be collected at some point f nearer to the lens. If F be now considered as the focus of light incident on the centre of v, and F′ be the conjugate focus, the marginal ray p F would be refracted to some point f' lying beyond F′. Therefore the marginal ray pf may be refracted to F, if the aberration of the concave be properly adjusted to that of the convex.

This brings us to the most difficult part of our subject, the compounded aberrations of different surfaces. Our limits will not give us room for treating this in the same elementary and perspicuous manner that we employed for a single surface. We must try to do it in a compendious way, which will admit at once the different surfaces and the different refractive powers of different substances. This must naturally render the process more complicated; but we hope to treat the subject in a way easily comprehended by any person moderately acquainted with common algebra; and we trust that our attempt will be favourably received by an indulgent public, as it is (as far as we know) the only dissertation in our language on the construction of achromatic instruments. We cannot but express our surprise at this indifference about an invention which has done so much honour to our country, and which now constitutes a very lucrative branch of its manufacture. Our artists infinitely surpass all the performances of foreigners in this branch, and supply the markets of Europe without any competition; yet it is from the writings on the continent that they derive their scientific instruction, and particularly from the dissertations of Clairaut, who has wonderfully simplified the analysis of optical propositions. We shall freely borrow from him, and from the writings of Abbé Boscovich, who has considerably improved the first views of Clairaut. We recommend the originals to the curious reader. Clairaut's dissertations are to be found in the Memoirs of the Academy of Paris, 1756, &c., those of Boscovich in the Memoirs of the Academy of Bologna, and in his five volumes of *Opuscula*, published at Bassano in 1785. To these may be added D'Alembert and Euler. The only thing in our language is the translation of a very imperfect work by Schærfer.

Fig. 9. *Lemma* 1. In the right-angled triangle MXS (fig. 9.), of which one side MX is very small in comparison of either of the others; the excess of the hypothenuse MS, above the side XS, is very nearly equal to $\frac{MX^2}{2MS}$ or to $\frac{MX^2}{2XS}$. For if about the centre S, with the radius SM, we describe the semicircle AMO, we have $AX \times XO = MX^2$. Now $AX = MS - SX$, and XO, is nearly equal to 2MS or 2XS; on the other hand, MS is nearly equal to $XS + \frac{MX^2}{2XS}$; and in like manner MG is nearly equal to $\frac{MX}{2XG} + XG$, and MH is nearly equal to $\frac{MX^2}{2XH} + XH$.

Prop. I. Let the ray m M, incident on the spherical surface AM, converge to G; that is, let G be the focus of incident rays. It is required to find the focus F of refracted rays?

Let m express the ratio of the sine of incidence and refraction; that is, let m be to 1 as the sine of incidence to the sine of refraction in the substance of the sphere.

Then - MG : GS = sin. MSH : sin. SMG,
and - m : 1 = sin. SMG : sin. SMH;
therefore $m \times$ MG : GS = sin. MSH : sin. SMH.
Now S, MSH : S, SMH = MH : HS. Therefore, finally,
m MG : GS = MH : HS.

Now let MS, the radius of the refracting surface, be called a. Let AG, the distance of the focus of incident rays from the surface, be called r. And let AH, the focal distance of refracted rays, be called x. Lastly, let the sine MX of the semi-aperture be called e. Observe, too, that a, r, x, are to be considered as positive quantities, when AS, AG, AH, lie from the surface in the direction in which the light is supposed to move. If therefore the refracting surface be concave, that is, having the centre on that side from which the light comes; or if the incident rays are divergent, or the refracted rays are divergent; then a, r, x, are negative quantities.

It is plain that $HS = x - a$; $GS = r - a$; also $AX = \frac{e^2}{2a}$ nearly. $HX = a - \frac{e^2}{2a}$. $GX = r - \frac{e^2}{2a}$. Now add to HX and to GX their differences from MH and MG, which (by the Lemma) are $\frac{e^2}{2x}$ and $\frac{e^2}{2r}$. We get MH $= x - \frac{e^2}{2a} + \frac{e^2}{2x}$, and $MG = r - \frac{e^2}{2a} + \frac{e^2}{2r}$. In order to shorten our notation, make $k = \frac{1}{a} - \frac{1}{r}$. This will make $MG = r - \frac{ke^2}{2}$.

Now substitute these values in the final analogy at the top of this column, viz. $MH : HS = m.MG : GS$; it becomes $x - \frac{e^2}{2a} + \frac{e^2}{2x} : x - a = m\,r - \frac{m\,k\,e^2}{2} : r - a$ (or $a\,r\,k$), because $k = \frac{r-a}{a\,r}$, and $a\,r\,k = r - a$. Now multiply the extreme and mean terms of this analogy. It is evident that it must give us an equation which will give us a value of x or AH, the quantity sought.

But this equation is quadratic. We may avoid the solution by an approximation which is sufficiently accurate, by substituting for x in the fraction $\frac{e^2}{2x}$ (which is very small in all cases of optical instruments), an approximate very easily obtained, and very near the truth. This is the focal distance of an infinitely slender pencil of rays converging to G. This we know by the common optical theorem to be $\frac{a\,m\,r}{m - 1\,r \pm a}$. Let this be

called

Telescope. called φ; if we substitute k in place of $\frac{1}{a} - \frac{1}{r}$, this value of φ becomes $= \frac{a\,m}{m - a\,k}$.

This gives us, by the by, an easily remembered expression (and beautifully simple) of the refracted focus of an infinitely slender pencil, corresponding to any distance r of the radiant point. For since $\varphi = \frac{a\,m}{m - a\,k}$, $\frac{1}{\varphi}$ must be $= \frac{m - a\,k}{a\,m}, = \frac{m}{a\,m}, - \frac{a\,k}{a\,m} = \frac{1}{a} - \frac{k}{m}$. We may even express it more simply, by expanding k, and it becomes $\frac{1}{\varphi} = \frac{1}{a} - \frac{1}{m\,a} - \frac{1}{m\,r}$.

Now put this value of $\frac{1}{\varphi}$ in place of the $\frac{1}{x}$ in the analogy employed above. The first term of the analogy becomes $x - \frac{e^2}{2\,a} + \frac{e^2}{2\,a} - \frac{k\,e^2}{2\,m}$, or $x - \frac{k\,e^2}{2\,m}$. The analogy now becomes $x - \frac{k\,e^2}{2\,m} : x\,a = m\,r - \frac{m\,k\,e^2}{2} : a\,r\,k$. Hence we obtain the linear equation $m\,r\,x - \frac{m\,k\,e^2\,x}{2} - m\,r\,a + \frac{m\,k\,a\,e^2}{2} = a\,r\,k\,x - \frac{a\,r\,k\,e^2}{2\,m}$; from which we finally deduce

$$x = \frac{m\,r\,a - \frac{1}{2}\,m\,a\,k\,e^2 - \frac{a\,r\,k^2\,e^2}{2\,m}}{m\,r - a\,r\,k - \frac{1}{2}\,m\,k\,e^2}$$

We may simplify this greatly by attending to the elementary theorem in fluxions, that the fraction $\frac{x + \dot{x}}{y + \dot{y}}$ differs from the fraction $\frac{x}{y}$ by the quantity $\frac{y\dot{x} - x\dot{y}}{y^2}$; this being the fluxion of $\frac{x}{y}$. Therefore $\frac{x + \dot{x}}{y + \dot{y}} = \frac{x}{y} + \frac{y\dot{x} - x\dot{y}}{y^2}$. Now the preceding formula is nearly in this situation. It may be written thus;

$$\frac{m\,r\,a \quad \left(-\frac{1}{2}\,m\,a\,k\,e^2 - \frac{a\,r\,k^2\,e^2}{2\,m}\right)}{m\,r - a\,r\,k \quad - m\,k\,e^2},$$

when the last terms of the numerator and denominator are very small in comparison with the first, and may be considered as the $\dot{x}$ and $\dot{y}$, while $m\,r\,a$ is the x, and $m\,r - a\,r\,k$ is the y. Treating it in this way, it may be stated thus:

$$x = \frac{m\,r\,a}{m\,r - a\,r\,k} + \frac{(m\,r\,a)\,\frac{1}{2}\,m\,k\,e^2 - (m\,r - a\,r\,k)\left(\frac{1}{2}\,m\,k\,a\,e^2 + \frac{a\,r\,k^2\,e^2}{2\,m}\right)}{r^2\,(m - a\,k)^2}$$

$$\text{or } x = \frac{m\,r\,a}{r\,(m - a\,k)} + \frac{(m\,r\,a)\,m\,k - (m\,r - a\,r\,k)\left(m\,k\,a + \frac{a\,r\,k^2}{m}\right)}{r^2\,(m - a\,k)^2} \times \frac{1}{2}\,e^2.$$

The first term $\frac{m\,r\,a}{r\,(m - a\,k)}$, or $\frac{m\,a}{m - a\,k}$, is evidently $= \varphi$, the focal distance of an infinitely slender pencil.

Therefore the aberration is expressed by the second term, which we must endeavour to simplify. Telescope.

If we now perform the multiplication indicated by $-(m\,r - a\,r\,k) \times \left(m\,k\,a - \frac{a\,r\,k^2}{m}\right)$, it is plain that $-m\,r \times m\,k\,a$ destroys the first term $m\,r\,a \times m\,k$ of the numerator of our small fraction, and there remains of this numerator $\left(m\,a^2\,r\,k^2 - a\,r^2\,k^2 + \frac{a^2\,r^2\,k}{m}\right)\frac{1}{2}\,e^2$, which is equal to $m^2\,a^2\left(\frac{r\,k^2}{m} - \frac{r^2\,k^2}{m^2\,a} + \frac{r^2\,k^2}{m^3}\right)\frac{1}{2}\,e^2$.

The denominator was $r^2\,(m - a\,k)^2$, and the fraction now becomes $\frac{m^2\,a^2}{(m - a\,k)^2}\left(\frac{k^2}{m\,r} - \frac{k^2}{m^2\,a} + \frac{k^3}{m^3}\right)\frac{1}{2}\,e^2$, which is evidently $= \varphi^2\left(\frac{k^2}{m\,r} - \frac{k^2}{m^2\,a} + \frac{k^3}{m^3}\right)\frac{e^2}{2}$. Now recollect that $k = \frac{1}{a} - \frac{1}{r}$. Therefore $\frac{k^3}{m^2} = \frac{k^2}{m^2}\left(\frac{1}{a} - \frac{1}{r}\right) = \frac{k^2}{m^2\,a} - \frac{k^2}{m^2\,r}$. Therefore, instead of $-\frac{k^2}{m^2\,a}$, write $\frac{-k^3}{m^2} - \frac{k^2}{m\,r}$, and we get the fraction $\varphi^2\left(\frac{k^3}{m^3} - \frac{k^3}{m^2} - \frac{k^2}{m^2\,r} + \frac{k^2}{m\,r}\right)\frac{e^2}{2} = \varphi^2\left(\frac{k^3}{m} - \frac{m\,k^3}{m^3} - \frac{m\,k^2}{m^3\,r} + \frac{m^2\,k^2}{m^3\,r}\right)\frac{e^2}{2}$, which is equal to $\varphi^2\,\frac{1 - m}{m^3}\left(k^3 - \frac{m\,k^2}{r}\right)\frac{e^2}{2}$, and finally to $-\varphi^2\,\frac{m - 1}{m^3}\left(k^3 - \frac{m\,k^2}{r}\right)\frac{e^2}{2}$.

Therefore the focal distance of refracted rays is $x = \varphi - \varphi^2\,\frac{m - 1}{m^3}\left(k^3 - \frac{m\,k^2}{r}\right)\frac{e^2}{2}$.

This consists of two parts. The first φ is the focal distance of an infinitely slender pencil of central rays, and the other $-\varphi^2\,\frac{m - 1}{m^3}\left(k^3 - \frac{m\,k^2}{r}\right)\frac{e^2}{2}$ is the aberration arising from the spherical figure of the refracting surface.

Our formula has thus at last put on a very simple form, and is vastly preferable to Dr Smith's for practice.

This aberration is evidently proportional to the square of the semi-aperture, and to the square of the distance φ: but in order to obtain this simplicity, several quantities were neglected. The assumption of the equality of AX to $\frac{e^3}{2\,a}$ is the first source of error. A much more accurate value of it would have been $\frac{2\,a\,e^2}{4\,a^2 + e^2}$, for it is really $= \frac{e^2}{2\,a - \mathrm{AX}}$. If for AX we substitute its approximated value $\frac{e^2}{2\,a}$, we should have $\mathrm{AX} = \frac{e^2}{2a - \frac{e^2}{2\,a}}$, $= \frac{2\,a\,e^2}{4\,a^2 - {}^2}$. To have used this value would not have much complicated the calculus; but it did not occur to us till we had finished the investigation, and it would have required the whole to be changed. The operation in page 246. col. 1. par. 3. is another source of error. But these errors are very inconsiderable when the aperture

Telescope. ture is moderate. They increase for the most part with an increase of aperture, but not in the proportion of any regular function of it; so that we cannot improve the formula by any manageable process, and must be contented with it. The errors are precisely the same with those of Dr Smith's theorem, and indeed with those of any that we have seen, which are not vastly more complicated.

As this is to be frequently combined with subsequent operations, we shorten the expression by putting θ for $\frac{m-1}{m^3}\left(k^3 - \frac{m k^2}{r}\right)\frac{e^2}{2}$. Then $\varphi^2 \theta$ will express the aberration of the first refraction from the focal distance of an infinitely slender pencil; and now the focal distance of refracted rays is $f = \varphi - \varphi^2 \theta$.

If the incident rays are parallel, r becomes infinite, and $\theta = \frac{m-1}{m^3} k^3 \frac{e^2}{2}$. But in this case k becomes $= \frac{1}{a}$, and $\frac{1}{\varphi} = \frac{m-1}{m a}$, and $\varphi = \frac{m a}{m-1}$, and $\varphi^2 \theta$ becomes $\frac{m^2 a^2}{(m-1)^2} \times \frac{m-1}{m^3} \times \frac{1}{a^3} \times \frac{e^2}{2}, = \frac{e^2}{2 m - 1) m a}$. This is the aberration of extreme parallel rays.

We must now add the refraction of another surface.

Lemma 2. If the focal distance AG be changed by a small quantity Gg, the focal distance AH will also be changed by a small quantity H h, and we shall have

$$m \cdot \mathrm{AG}^2 : \mathrm{AH}^2 = \mathrm{G}g : \mathrm{H}h.$$

Draw M g, M h, and the perpendiculars G i, H k. Then, because the sines of the angles of incidence are in a constant ratio to the sines of the angles of refraction, and the increments of these small angles are proportional to the increments of the sines, these increments of the angles are in the same constant ratio. Therefore,

We have the angle CM g to HM h as m to 1.

Now $\mathrm{G}g : \mathrm{G}i = \mathrm{AG} : \mathrm{AM}$,
and $\mathrm{G}i : hk = m \cdot \mathrm{AG} : \mathrm{HA}$,
and $hk : \mathrm{H}h = \mathrm{MA} : \mathrm{AH}$:
therefore $\mathrm{G}g : \mathrm{H}h = m \cdot \mathrm{AG}^2 : \mathrm{AH}^2$.

The easiest and most perspicuous method for obtaining the aberration of rays twice refracted, will be to consider the first refraction as not having any aberration, and determine the aberration of the second refraction. Then conceive the focus of the first refraction as shifted by the aberration. This will produce a change in the focal distance of the second refraction, which may be determined by this Lemma.

Fig. 10. Prop. II. Let AM, BN (fig. 10.) be two spherical surfaces, including a refracting substance, and having their centres C and c in the line AG. Let the ray aA pass through the centres, which it will do without refraction. Let another ray m M, tending to G, be refracted by the first surface into M H, cutting the second surface in N, where it is farther refracted into NI. It is required to determine the focal distance BI?

It is plain that the sine of incidence on the second surface is to the sine of refraction into the surrounding air as 1 to m. Also BI may be determined in relation to BH, by means of BH, Nx, Bc, and $\frac{1}{m}$, in the same way that AH was determined in relation to AG, by means of AG, MX, AC, and m.

Let the radius of the second surface be b, and let e still express the semi-aperture, because it hardly differs from Nx). Also let α be the thickness of the lens. Then observe, that the focal distance of the rays refracted by the first surface, (neglecting the thickness of the lens and the aberration of the first surface), is the distance of the radiant point for the second refraction, or is the focal distance of rays incident on the second surface. In place of r therefore we must take φ; and as we made $k = \frac{1}{a} - \frac{1}{r}$, in order to abbreviate the calculus, let us now make $l = \frac{1}{b} - \frac{1}{\varphi}$; and make $\frac{1}{f} = \frac{1}{b} - m l$, as we made $\frac{1}{\varphi} = \frac{1}{a} - \frac{k}{m}$. Lastly, in place of $\theta = \frac{m-1}{m^3}\left(k^3 - \frac{m k^2}{r}\right)\frac{e^2}{2}$, make $\theta' = \left(\frac{1}{m} - 1\right) m^3 \left(l^3 - \frac{l^2}{m \varphi}\right)\frac{e^2}{2}, = -\frac{m-1}{m}\left(m^3 l^3 - \frac{m^2 l^2}{\varphi}\right)\frac{e^2}{2}$.

Thus we have got an expression similar to the other; and the focal distance BI, after two refractions, becomes $\mathrm{BI} = f - f^2 \theta'$.

But this is on the supposition that B H is equal to φ, whereas it is really $\varphi - \varphi^2 \theta - \alpha$. This must occasion a change in the value just now obtained of BI. The source of the change is twofold. 1st, Because in the value $\frac{1}{b} - \frac{1}{\varphi}$, we must put $\frac{1}{b} - \frac{1}{\varphi - \varphi^2 \theta - \alpha}$, and because we must do the same in the fraction $\frac{m^2 l^2}{\varphi}$. In the second place, when the value of BH is diminished by the quantity $\varphi^2 \theta + \alpha$, BI will suffer a change in the proportion determined by the 2d Lemma. The first difference may safely be neglected, because the value of θ is very small, by reason of the coefficient $\frac{e^2}{2}$ being very small, and also because the variation bears a very small ratio to the quantity itself, when the true value of φ differs but little from that of the quantity for which it is employed. The chief change in BI is that which is determined by the Lemma. Therefore take from BI the variation of BH, multiplied by $\frac{m\,\mathrm{BI}^2}{\mathrm{BH}^2}$, which is very nearly $= \frac{m f^2}{\varphi^2}$. The product of this multiplication is $m f^2 \theta + \frac{m f^2 \alpha}{\varphi^2}$. This being taken from f, leaves us for the value of BI $f - \frac{f^2 m \alpha}{\varphi^2} - f^2 (m \theta + \theta')$.

In this value f is the focal distance of an infinitely slender pencil of rays twice refracted by a lens having no thickness, $\alpha \frac{m f^2}{\varphi}$ is the shortening occasioned by the thickness, and $f^2 (m \theta + \theta')$ is the effect of the two aberrations arising from the aperture.

It will be convenient, for several collateral purposes, to exterminate from these formulæ the quantities k, l and φ. For this purpose make $\frac{1}{n} = \frac{1}{a} - \frac{1}{b}$. We have already $k = \frac{1}{a} - \frac{1}{r}$; and $\frac{1}{\varphi} = \frac{1}{a} - \frac{1}{m a} + \frac{1}{m r}$; and $l = \frac{1}{b} - \frac{1}{\varphi}, = \frac{1}{b} - \frac{1}{a} + \frac{1}{m a} - \frac{1}{m r}$. Now for $\frac{1}{b} - \frac{1}{a}$ write $-\frac{1}{n}$,

and

and we get $l = \frac{1}{ma} - \frac{1}{mr} - \frac{1}{n}$. Therefore $\frac{1}{f} = \frac{1}{b} - ml$ (by construction, page 347. Prop. II.) becomes $= \frac{1}{b} - \frac{1}{a} + \frac{1}{r} + \frac{m}{n}, = \frac{m}{n} + \frac{1}{r} - \frac{1}{n}, - \frac{m-1}{n} + \frac{1}{r}$.

This last value of $\frac{1}{f}$ (the reciprocal of the focus of a slender pencil twice refracted), viz. $\frac{m-1}{n} + \frac{1}{r}$, is the simplest that can be imagined, and makes n as a substitute for $\frac{1}{a} - \frac{1}{b}$; a most useful symbol, as we shall frequently find in the sequel. It also gives a very simple expression of the focal distance of parallel rays, which we may call the principal focal distance of the lens, and distinguish it in future by the symbol p; for the expression $\frac{1}{f} = \frac{m-1}{n} + \frac{1}{r}$, becomes $\frac{1}{p} = \frac{m-1}{n}$ when the incident light is parallel. And this gives us another very simple and useful measure of f; for $\frac{1}{f}$ becomes $= \frac{1}{p} + \frac{1}{r}$. These equations $\frac{1}{f} = \frac{m-1}{n} + \frac{1}{r}$, $\frac{1}{p} = \frac{m-1}{n}$, and $\frac{1}{f} = \frac{1}{p} + \frac{1}{r}$, deserve therefore to be made very familiar to the mind.

We may also take notice of another property of n. It is half the radius of an isosceles lens, which is equivalent to the lens whose radii are a and b: for suppose the lens to be isosceles, that is $a = b$; then $n = \frac{1}{a} - \frac{1}{a}$. Now the second a is negative if the first be positive, or positive if the first be negative. Therefore $\frac{1}{a} - \frac{1}{b} = \frac{1+b}{a^2} = \frac{a+a}{a^2} = \frac{2}{a}$, and $\frac{1}{n} = \frac{2}{a}$, and $n = \frac{a}{2}$. Now the focal distance of this lens is $\frac{m-1}{n}$, and so is that of the other, and they are equivalent.

But, to proceed with our investigation, recollect that we had $\theta = \frac{m-1}{m^3}\left(k^3 - \frac{mk^2}{r}\right)\frac{e^2}{2}$. Therefore $m\theta = \frac{m-1}{m}\left(\frac{k^3}{m} - \frac{k^2}{r}\right)\frac{e^2}{2}$. And θ' was $= \frac{m-1}{m}\left(-m^3 l^3 + \frac{m l^2}{\varphi}\right)\frac{e^2}{2}$. Therefore $m\theta + \theta$, the aberration (neglecting the thickness of the lens is $f^2 \frac{m-1}{m}\left(\frac{k^3}{m} - \frac{k^2}{r} - m^3 l^3 + \frac{m l^2}{\varphi}\right)\frac{e^2}{2}$.

If we now write for k, l, and φ, their values as determined above, performing all the necessary multiplications, and arrange the terms in such a manner as to collect in one sum the coefficients of a, n, and r, we shall find 4 terms for the value of $m\theta$, and 10 for the value of θ'. The 4 are destroyed by as many with contrary signs in the value of θ', and there remain 6 terms to express the value of $m\theta + \theta'$, which we shall express by one symbol 9; and the equation stands thus:

$$q = \frac{m-1}{m}\left(\frac{m^3}{n^3} - \frac{2m^2+m}{an^2} + \frac{m+2}{a^2 n} + \frac{3m^2+m}{rn^2} - \frac{4m+4}{arn} + \frac{3m+2}{r^2 n}\right)\frac{e^2}{2}.$$

The focal distance therefore of rays twice refracted, reckoned from the last surface, or BI, corrected for aberration, and for the thickness of the lens, is $f - f\frac{m\alpha}{\varphi^2} - f^2 q$, consisting of three parts, viz. f, the focal distance of central rays; $f^2 \frac{m\alpha}{\varphi^2}$, the correction for the thickness of the lens; and $f^2 q$, the aberration.

The formula at the top of this column appears very complex, but is of very easy management, requiring only the preparation of the simple numbers which form the numerators of the fractions included in the parenthesis. When the incident rays are parallel, the terms vanish which have r in the denominator, so that only the three first terms are used.

We might here point out the cases which reduce the aberration expressed in the formula last referred to, to nothing; but as they can scarcely occur in the object-glass of a telescope, we omit it for the present, and proceed to the combination of two or more lenses.

Lemma 3. If AG be changed by a small quantity Gg, BI suffers a change Ii, and Gg : Ii = AG^2 : BI^2. For it is well known that the small angles GMg and INi are equal; and therefore their subtenses Gk, In are proportional to MG, NI, or to AG, AI nearly, when the aperture is moderate. Therefore we have (nearly)

Gk : In : AG : BI
In : Ii = AM : BI
Gg : Gk = AG : AM
Therefore Gg : Ii = AG^2 : BI^2

Prop. III. To determine the focal distance of rays refracted by two lenses placed near to each other on a common axis.

Let AM, BN (fig. 11.) be the surfaces of the first lense, and CO, DP be the surfaces of the second, and let β be the thickness of the second lens, and δ the interval between them. Let the radius of the anterior surface of the second lens be a', and the radius of its posterior surface be b'. Let m' be to 1 as the sine of incidence to the sine of refraction in the substance of the second lens. Lastly, let p' be the principal focal distance of the second lens. Let the extreme or marginal ray meet the axis in L after passing through both lenses, so that DL is the ultimate focal distance, reckoned from the last surface. Fig. 11.

It is plain that DL may be determined by means of a', b', m', p', and CI, in the same manner that BI was determined by means of a, b, m, p, and AG.

The value of BI is $f - m\alpha\frac{f^2}{\varphi^2} - f^2 q$. Take from this the interval δ, and we have CI $= f - m\alpha\frac{f^2}{\varphi^2} - \delta - f^2 q$. Let the small part $- m\alpha\frac{f^2}{\varphi^2} - \delta - f^2 q$ be neglected for the present, and let CI be supposed $= f$. As we formed φ, f, and q, by means of a, b, m, n, and r,

Telescope. r, let us now form φ', f', and q', for the second lens, by means of a', b', m', n', $\left(=\frac{1}{a'}-\frac{1}{b'}\right)$, and r'. φ' will be the focal distance of a slender pencil refracted by the first surface, f will be the focal distance of this pencil after two refractions, and q' will be the coefficient of the aberration, neglecting the thickness and interval of the lenses.

Proceeding in this way, DL will be $=f'-m\beta\frac{f^2}{\varphi}-f'^2 q$. But because CI is really less than f, by the quantity $m\alpha\frac{f^2}{\varphi'^2}+\delta+f^2 q'$, we must (by Lemma 3.) subtract the product of this quantity, multiplied by $\frac{DL}{BI^2}$, (which is nearly $\frac{f'^2}{f^2}$), from $f'-m\beta\frac{f'^2}{\varphi'^2}f'^2 q'$.

By this process we shall have

$$DL=f'-f'^2\left(\frac{m\alpha}{\varphi^2}+\frac{\delta}{f^2}+\frac{m'\beta}{\varphi'^2}\right)-f^2(q+q').$$

The first term f' of this value of DI is the focal distance of a slender pencil of central rays refracted by both lenses, neglecting their thickness and distance; the second term, $-f^2\left(\frac{m\alpha}{\varphi^2}+\frac{\delta}{f^2}+\frac{m'\beta}{\varphi'^2}\right)$ is the correction necessary for these circumstances; and the third term, $-f'^2(q+q')$, is the correction for the aperture $2e$. And it is evident that q' is a formula precisely similar to q, containing the same number of terms, and differing only by the m', a', n', and r', employed in place of m, a, n, and r.

It is also evident, that if there be a third lens, we shall obtain its focal distance by a process precisely similar to that by which we obtained DL; and so on for any number of lenses.

Thus have we obtained formulæ by which the foci of rays are determined in the most general terms; and in such a manner as shall point out the connection of the curvatures, thicknesses and distances of the lenses, with their spherical aberrations, and with the final aberration of the compound lens, and give the aberrations in separate symbols, so that we can treat them by themselves, and subject them to any conditions which may enable us to correct one of them by another.

We also see in general, that the corrections for the thickness and distance of the lenses are exhibited in terms which involve only the focal distances of central rays, and have very little influence on the aberrations, and still less on the ratio of the aberrations of the different lenses. This is a most convenient circumstance; for we may neglect them while we are determining q and q', and in determining the ratio of the focal distances of the several lenses, on which the correction of the chromatic aberration chiefly depends. Therefore, in the construction of a compound lens for uniting the different colours, we may neglect this correction for the thickness and distance till the end of the process. When we apply it, we shall find that it chiefly affects the final focal distance, making it somewhat longer, but has hardly any influence either on the chromatic or spherical aberration. We do not hesitate to say, that the final formulæ here given are abundantly accurate, while they are vastly more manageable than those employed by Euler or D'Alembert. We have calculated trigonometrically the progress of the rays through one of the glasses, which will be given as an example, giving it a very extravagant aperture, that the errors of the formulæ might be very remarkable. We found the real aberration exceed the aberration assigned by the formula by no more than $\frac{1}{50}$th part, a difference which is quite insignificant. The process here given derives its simplicity from the frequent occurrence of harmonic proportions in all optical theorems. This enabled Mr Clairaut to employ the reciprocals of the radii and distances with so much simplicity and generality.

We consider it as another advantage of Mr Clairaut's method, that it gives, by the way, formulæ for the more ordinary questions in optics, which are of wonderful simplicity, and most easily remembered. The chief problems in the elementary construction of optical instruments relate to the focal distances of central rays. This determines the focal distances and arrangement of the glasses. All the rest may be called the refinement of optics; teaching us how to avoid or correct the indistinctness, the colours, and the distortions, which are produced in the images formed by these simple constructions. We shall mention a few of these formulæ which occur in our process, and tend greatly to abbreviate it when managed by an experienced analyst.

Let m be to 1 as the sine of incidence to the sine of refraction; let a and b be the radii of the anterior and posterior surfaces of a lens; let r be the distance of the radiant point, or the focus of incident central rays, and f the distance of the conjugate focus; and let p be the principal focal distance of the lens, or the focal distance of parallel rays. Make $\frac{1}{n}$ equal to $\frac{1}{a}-\frac{1}{b}$; let the same letters a', b', r', &c. express the same things for a second lens; and a'', b'', r'', &c. express them for a third; and so on. Then we have $\frac{1}{f}=\frac{m-1}{n}+\frac{1}{r}$; $\frac{1}{f}=\frac{m'-1}{n'}+\frac{1}{r'}$; $\frac{1}{f''}=\frac{m''-1}{n''}+\frac{1}{r''}$, &c.

Therefore when the incident light is parallel, and r infinite, we have $\frac{1}{p}=\frac{m-1}{n}$; $\frac{1}{p'}=\frac{m'-1}{n'}$; $\frac{1}{p''}=\frac{m''-1}{n''}$, &c.

And when several lenses are contiguous, so that their intervals may be neglected, and therefore $\frac{1}{f}$, belonging to the first lens, becomes $\frac{1}{r'}$, belonging to the second, we have

1. $\frac{1}{r'}=\frac{1}{f}=\frac{m-1}{n}+\frac{1}{r}, =\frac{1}{p}+\frac{1}{r}$.
2. $\frac{1}{r''}=\frac{1}{f'}, =\frac{m'-1}{n'}+\frac{m-1}{n}+\frac{1}{r}, =\frac{1}{p'}+\frac{1}{p}+\frac{1}{r}$
3. $\frac{1}{f''}=\frac{m''-1}{n''}+\frac{m'-1}{n}+\frac{m-1}{n}+\frac{1}{r}, =\frac{1}{p''}+\frac{1}{p'}+\frac{1}{p}+\frac{1}{r}$.

Nothing can be more easily remembered than these formulæ, how numerous so ever the glasses may be.

Having thus obtained the necessary analysis and formula,

mula, it now remains to apply them to the construction of achromatic lenses; in which it fortunately happens, that the employment of several surfaces, in order to produce the union of the differently refrangible rays, enables us at the same time to employ them for correcting each other's spherical aberration.

In the article OPTICS we gave a general notion of the principle on which we may proceed in our endeavours to unite the differently refrangible rays. A white or compounded ray is separated by refraction into its component coloured rays, and they are diffused over a small angular space. Thus it appears, that the glass used by Sir Isaac Newton in his experiments diffused a white ray, which was incident on its posterior surface in an angle of 30°, in such a manner that the extreme red ray emerged into air, making an angle of 50° 21⅓′ with the perpendicular; the extreme violent ray emerged in an angle of 51° 15⅔′; and the ray which was in the confines of green and blue, emerged in an angle of 50° 48⅓′. If the sine of the angle 30° of incidence be called 0.5, which it really is, the sine of the emergence of the red ray will be 0.77; that of the violet ray will be 0.78; and that of the intermediate ray will be 0.77½, an exact mean between the two extremes. This ray may therefore be called the mean refrangible ray, and the ratio of 77½ to 50, or of 1.55 to 1, will very properly express the mean refraction of this glass; and we have for this glass $m=1.55$. The sine of refraction, being measured on a scale, of which the sine of incidence occupies 100 parts, will be 154 for the red ray, 155 for the mean ray, and 156 for the violet ray. This number, or its ratio to unity, is commonly taken to represent the refractive power of the glass. There is some impropriety in this, unless we consider ratios as measured by their logarithms: for if m be 1, the substance does not refract at all. The refractive power can be properly measured only by the refraction which it produces; that is, by the change which it makes in the direction of the light, or the angle contained between the incident and refracted rays. If two substances produce such deviations always in one proportion, we should then say that their refractive powers are in that proportion. This is not true in any substances; but the sines of the angles, contained between the refracted ray and the perpendicular, are always in one proportion when the angle of incidence in both substances is the same. This being a cognisable function of the real refraction, has therefore been assumed as the only convenient measure of the refractive powers. Although it is not strictly just, it answers extremely well in the most usual cases in optical instruments: the refractions are moderate; and the sines are very nearly as the angles contained between the rays and the perpendicular; and the real angles of refraction, or deflections of the rays, are almost exactly proportional to $m-1$. The most natural and obvious measure of the refractive powers would therefore be $m-1$. But this would embarrass some very frequent calculations; and we therefore find it best, on the whole, to take m itself for the measure of the refractive power.

The separation of the red, violet, and intervening rays, has been called *dispersion;* and although this arises merely from a difference of the refractive power in respect of the different rays, it is convenient to distinguish this particular modification of the refractive power by a name, and we call it the DISPERSIVE POWER of the refracting substance.

It is susceptible of degrees; for a piece of flint-glass will refract the light, so that when the sine of refraction of the red ray is 77, the sine of the refraction of the violet ray is nearly 78½; or if the sine of refraction of the red ray, measured on a particular scale, is 1.54, the sine of refraction of the violet ray is 1.57. The dispersion of this substance, being measured by the difference of the extreme sines of refraction, is greater than the dispersion of the other glass, in the proportion of 3 to 2.

But this alone is not a sufficient measure of the absolute dispersive power of a substance. Although the ratio of 1.54 to 1.56 remains constant, whatever the real magnitude of the refractions of common glass may be, and though we therefore say that its dispersive power is constant, we know, that by increasing the incidence and the refraction, the absolute dispersion is also increased. Another substance shows the same properties, and in a particular case may produce the same dispersion; yet it has not for this sole reason the same dispersive power. If indeed the incidence and the refraction of the mean ray be also the same, the dispersive power cannot be said to differ; but if the incidence and the refraction of the mean ray be less, the dispersive power must be considered as greater, though the actual dispersion be the same; because if we increase the incidence till it becomes equal to that in the common glass, the dispersion will now be increased. The proper way of conceiving the dispersion therefore is, to consider it as a portion of the whole refraction; and if we find a substance making the same dispersion with half the general refraction, we must say that the dispersive quality is double; because by making the refraction equal, the dispersion will really be double.

If therefore we take $\dot{m}$ as a symbol of the separation of the extreme rays from the middle ray, $\frac{\dot{m}}{m-1}$ is the natural measure of the dispersive power. We shall express this in the Leibnitzian notation, thus $\frac{dm}{m-1}$, that we may avoid the indistinctness which the Newtonian notation would occasion when m is changed for m' or m''.

It is not unusual for optical writers to take the whole separation of the red and violent rays for the measure of the dispersive power, and to compare this with the refracting power with respect to one of the extreme rays. But it is surely better to consider the mean refraction as the measure of the refracting power: and the deviation of either of the extremes from this mean is a proper enough measure of the dispersion, being always half of it. It is attended with this convenience, that being introduced into our computations as a quantity infinitely small, and treated as such for the ease of computation, while it is really a quantity of sensible magnitude; the errors arising from this supposition are diminished greatly, by taking one half of the deviation and comparing it with the mean refraction. This method has, however, this inconvenience, that it does not exhibit at once the refractive power in all substances respecting any particular colour of light; for it is not the ray of any particular colour that suffers the mean refraction. In common glass it is the ray which is in the confines of the yellow and blue; in flint-glass it is nearly the middle

dle blue ray; and in other substances it is a different ray. These circumstances appear plainly in the different proportions of the colours of the prismatic spectrum exhibited by different substances. This will be considered afterwards, being a great bar to the perfection of achromatic instruments.

The way in which an achromatic lens is constructed is, to make use of a contrary refraction of a second lens to destroy the dispersion or spherical aberration of the first.

The first purpose will be answered if $\frac{dm}{n}$ be equal to $-\frac{dm'}{n'}$. For, in order that the different coloured rays may be collected into one point by two lenses, it is only necessary that $\frac{1}{f'}$, the reciprocal of the focal distance of rays refracted by both, may be the same for the extreme and mean rays, that is, that $\frac{m+dm-1}{n}+\frac{m'+dm'-1}{n'}+\frac{1}{r}$ be of the same value with $\frac{m-1}{n}+\frac{m'-1}{n'}+\frac{1}{r}$, which must happen if $\frac{dm}{n}+\frac{dm'}{n'}$ be $=0$, or $\frac{dm}{n}=-\frac{dm'}{n}$. This may be seen in another way, more comprehensible by such as are not versant in these discussions. In order that the extreme colours which are separated by the first lens may be rendered parallel by the second; we have shown already that n and n' are proportional to the radii of the equivalent isosceles lenses, being the halves of these radii. They are therefore (in these small refractions) inversely proportional to the angles formed by the surfaces at the edges of the lenses. n' may therefore be taken for the angle of the first lens, and n for that of the second. Now the small refraction by a prism, whose angle (also small) is n', is $\overline{m-1}\times n$. The dispersive power being now substituted for the refractive power, we have for this refraction of the prism $dm\times n'$. This must be destroyed by the opposite refraction of the other prism $dm'\times n$. Therefore $dm\times n'=dm'\times n$, or $\frac{dm}{n}=-\frac{dm'}{n'}$. In like manner, this effect will be produced by three lenses if $\frac{dm}{n}+\frac{dm'}{n'}+\frac{dm''}{n''}$ be $=0$, &c.

Lastly, the errors arising from the spherical figure, which we expressed by $-R^2(q+q')$ will be corrected if $q+q'$ be $=0$. We are therefore to discover the adjustments of the quantities employed in the preceding formulæ, which will insure these conditions. It will render the process more perspicuous if we collect into one view the significations of our various symbols, and the principal equations which we are to employ.

1. The ratios to unity of the sines of mean incidence in the different media are - m, m', m''
2. The ratio of the differences of the sines of the extremes - - $\frac{dm}{dm'}, = u.$
3. The ratio $\frac{m-1}{m'-1}$ - - $=c.$
4. The radii of the surfaces $a, b; a', b'; a'', b''.$
5. The principal focal distances, or the focal distances of parallel central rays, - $p, p', p''.$
6. The focal distance of the compound lens P.
7. The distance of the radiant point, or of the focus of incident rays on each lens $r, r', r''.$
8. The focal distance of the rays refracted by each lens - - - $f, f', f''.$
9. The focal distance of rays refracted by the compound lens - - F.
10. The half breadth of the lens $e.$

Also the following subsidiary values:

1. $\frac{1}{n}=\frac{1}{a}-\frac{1}{b}$; $\frac{1}{n'}=\frac{1}{a'}-\frac{1}{b'}$; $\frac{1}{n''}=\frac{1}{a''}-\frac{1}{b''}$.

2. $q=\frac{m-1}{m}\left(\frac{m'^3}{n^3}-\frac{2m^2+m}{an^2}+\frac{m+2}{a^2n}+\frac{3m^2+m}{rn^2}-\frac{4(m+1)}{arn}+\frac{3m+2}{r^2n}\right)\frac{e^2}{2}$. And q' and q'' must be formed in the same manner from m', a', n', r'; and from m'', a'', n'', r'', as q is formed from m, a, n, r.

3. Also, because in the case of an object-glass, r is infinitely great, the last term $\frac{1}{r}$ in all the values of $\frac{1}{f}, \frac{1}{f'}, \frac{1}{f''}, \frac{1}{r}, \frac{1}{r'}, \frac{1}{r''}$, will vanish, and we shall also have F=P.

Therefore in a double object-glass $\frac{1}{P}=\frac{m'-1}{n'}+\frac{m-1}{n}=\frac{1}{p}+\frac{1}{p'}$.

And in a triple object-glass $\frac{1}{P}=\frac{m''-1}{n''}+\frac{m'-1}{n'}+\frac{m-1}{n}, =\frac{1}{p''}+\frac{1}{p'}+\frac{1}{p}$.

Also, in a double object-glass, the correction of spherical aberration requires $q+q'=v$.

And a triple object-glass requires $q+q'+q''=v$. For the whole error is multiplied by F^2, and by $\frac{1}{2}e^2$; and therefore the equation which corrects this error may be divided by $F^2\frac{1}{2}e^2$.

This equation in the fourteenth line from the top of the column, giving the value of q, q', q'', may be much simplified as follows: In the first place, they may be divided by m, m', or m'', by applying them properly to the terms within the parenthesis, and expunging them from the denominator of the general factors $\frac{m-1}{m}, \frac{m'-1}{m'}, \frac{m''-1}{m''}$. This does not alter the values of q, q', and q''. In the second place the whole equations may be afterwards divided by $m'-1$. This will give the values of $\frac{q}{m'-1}, \frac{q'}{m'-1}$, and $\frac{q''}{m'-1}$, which will still be equal to nothing if $q+q'+q''$ be equal to nothing.

This division reduces the general factor $\frac{m'-1}{m'}$ of q' to $\frac{1}{m'}$. And in the equation for q we obtain, in place of the general factor $\frac{m-1}{m}$, the factor $\frac{m-1}{m'-1}$, or c. This will also be the factor of the value of q'' when the third lens is of the same substance with the first, as is generally

ly the case. And, in the third place, since the rays incident on the first lens are parallel, all the terms vanish from the value of q in which $\frac{1}{r}$ is found, and there remain only the three first, viz. $\frac{m^3}{n^3} - \frac{2m^2+m}{an^2} + \frac{m+2}{a^2n}$.

Performing these operations, we have

$$\frac{q}{m'-1} = c\left(\frac{m^3}{n^3} - \frac{2m+1}{an^2} + \frac{m+2}{m\,a^2\,n}\right)\frac{e^2}{2}$$

$$\frac{q'}{m'-1} = \left(\frac{m'^3}{n'^3} - \frac{2m'+1}{a'n'2} + \frac{m'+2}{m'a'^2n'} + \frac{3m'+1}{r'n'^2} - \frac{4(m'+1)}{m'a'r'n'} + \frac{3m'+2}{m'r'^2n'}\right)\frac{e^2}{2}$$

$$\frac{q''}{m'-1} = c\left(\frac{m^3}{n''^3} - \frac{2m+1}{a''n''^2} + \frac{m+2}{m''a''^2n''} + \frac{3m+1}{r''n''^2} + \frac{4(m+1)}{m''a''r''n''} + \frac{3m+2}{m''r''^2n''}\right)\frac{e^2}{2}$$

Let us now apply this investigation to the construction of an object-glass; and we shall begin with a double lens.

Construction of a Double Achromatic Object-glass.

Here we have to determine four radii a, b, a', and b'. Make $n=1$. This greatly simplifies the calculus, by exterminating it from all the denominators. This gives for the equation $\frac{dm}{n} + \frac{dm'}{n'} = 0$, the equation $dm + \frac{dm'}{n'} = 0$, or $dm = -\frac{dm'}{n'}$, and $\frac{1}{n'} = -\frac{dm}{dm'}, = -u$. Also we have r', the focal distance of the light incident on the second lens, the same with the principal focal distance p of the first lens, (neglecting the interval, if any). Now $\frac{1}{p} = \frac{m-1}{n}$, which in the present case is $=m-1$. Also $\frac{1}{p'}$ is $=-u)m'-1)$, and $\frac{1}{P} = m-1-u(m'-1) = u'$.

Make these substitutions in the values of $\frac{q}{m-1}$ and $\frac{q'}{m'-1}$, and we obtain the following equation:

$$c\,m^3 - \frac{c(2\,m+1)}{a} + \frac{c(m+2)}{m\,a^2} - u^3\,m'^2 - \frac{u^2(2\,m'+1)}{a'} - \frac{u(m'+2)}{m'\,a'^2} + u^2(3m'+1)(m-1) + \frac{4u(m'+1)(m-1)}{m'\,a'} - \frac{u\,(3\,m'+2)\,(m-1)^2}{m'} = 0.$$

Arrange these terms in order, according as they are factors of $\frac{1}{a^2}$, $\frac{1}{a}$, $\frac{1}{a'^2}$, $\frac{1}{a'}$, or independent quantities. It puts on this form:

$$\frac{c\,(m+2)}{m} \times \frac{1}{a^2} - c'\,(2\,m+1) \times \frac{1}{a} - \frac{u\,(m'+2)}{m'} \times \frac{1}{a'^2} - \left(u^2\,(2\,m'+1) - \frac{4\,u\,(m'+1)\,(m-1)}{m'}\right) \times \frac{1}{a'} + c\,m^3 + u^2\,(3m'+1)\,(m-1) - u^3\,m'^2 - \frac{u\,(3\,m'+2)\,(m-1)^2}{m'} = 0.$$

Let A be the coefficient of $\frac{1}{a^2}$, B that of $\frac{1}{a}$, C that of $\frac{1}{a'^2}$, D that of $\frac{1}{a'}$, and E the sum of the independent quantity; that is, let A be $=\frac{c\,(m+2)}{m}$, $B=c(2\,m+1)$, $C=\frac{u\,(m'+2)}{m'}$, $D=u^2(2m'+2) - \frac{4\,u(m'+1)\,(m-1)}{m'}$, and $E = c\,m^3 + u^2\,(3\,m'+1)\,(m-1) - u^3\,m'^2 - \frac{u\,(3\,m'+2)\,(m-1)^2}{m'}$.

Our final equation becomes

$$\frac{A}{a^2} - \frac{B}{a} - \frac{C}{a'^2} - \frac{D}{a'} + E = 0.$$

The coefficients of this equation and the independent quantity are all known, from our knowledge of m, m' dm, dm'; and we are to find the values of a and a', and from them and $n=1$ to find the values of b and b'.

But it is evidently an indeterminate equation, because there are two unknown quantities; so that there may be an infinity of solutions. It must be rendered determinate by means of some other conditions to which it may be subjected. These conditions must depend on some other circumstances which may direct our choice.

One circumstance occurs to us which we think of very great consequence. In the passage of light from one substance to another, there is always a considerable portion reflected from the posterior surface of the first and from the anterior surface of the last; and this reflection is more copious in proportion to the refraction. This loss of light will therefore be diminished by making the internal surfaces of the lenses to coincide; that is, by making $b=a'$. This will be attended with another advantage. If we put between the glasses a substance of nearly the same refracting power, we shall not only completely prevent this loss of light, but we shall greatly diminish the errors which arise from an imperfect polish of the surfaces. We have tried this, and find the effect very surprising. The lens being polished immediately after the figure has been given it, and while it was almost impervious to light by reason of its roughness, which was still sensible to the naked eye, performed as well as when finished in the finest manner.

N. B. This condition, by taking away one refraction, obliges us to increase those which remain, and therefore increases the spherical aberrations. And since our formulæ do not fully remove those (by reason of the small quantities neglected in the process), it is uncertain whether this condition be the most eligible. We have, however, no direct argument to the contrary.

Let us see what determination this gives us.

In this case $\frac{1}{a'} = \frac{1}{b}, = \frac{1}{a} - 1$. For because $\frac{1}{n} = \frac{1}{a} - \frac{1}{b}$ and $n=1$, we have $1 + \frac{1}{b} = \frac{1}{a}$, and $\frac{1}{b} = \frac{1}{a} - 1$. Therefore $\frac{1}{a'^2} = \frac{1}{a^2} - \frac{2}{a} + 1$. Therefore, in our final equation, put $\frac{1}{a^2} - \frac{2}{a} + 1$ in place of $\frac{1}{a'^2}$, and $\frac{1}{a} - 1$ in

place

place of $\frac{1}{a'}$, and it becomes $\frac{A-C}{a^2} - \frac{B+D-2C}{a}$ $+E+D-C=0$.

Thus have we arrived at a common affected quadratic equation, where $\frac{1}{a}$ is the unknown quantity. It has the common form $px^2+qx+r=0$, where p is $=A-C$, q is equal to $2C-B-D$, r is equal to $E+D-C$, and x is equal to $\frac{1}{a}$.

Divide the equation by p, and we have $x^2+\frac{q}{p}x+\frac{r}{p}$ $=0$. Make $s=\frac{q}{p}$ and $t=\frac{r}{p}$, and we have x^2+sx $+t=0$. This gives us finally $\frac{1}{a}$, or $x=-\frac{1}{2}s\pm$ $\sqrt{\frac{1}{4}s^2-t}$.

This value of $\frac{1}{a}$ is taken from a scale of which the unit is half the radius of the isosceles lens which is equivalent to the first lens, or has the same focal distance with it. We must then find (on the same scale) the value of b, viz. $\frac{1}{a}-1$, which is also the value of a'. Having obtained a', we must find b' by means of the equation $\frac{1}{n'}=\frac{1}{a'}-\frac{1}{b'}$, and therefore $\frac{1}{b}=\frac{1}{a'}-\frac{1}{n'}$, But $\frac{1}{n'}=u$. Therefore $\frac{1}{b'}=\frac{1}{a'}+u$, $=\frac{1}{a}+u-1$.

Thus is our object-glass constructed; and we must determine its focal distance, or its reciprocal $\frac{1}{P}$. This is $=m-1-u\,(m'-1)$.

All these radii and distances are measured on a scale of which n is the unit. But it is more convenient to measure every thing by the focal distance of the compound object-glass. This gives us the proportion which all the distances bear to it. Therefore, calling P unity, in order to obtain $\frac{1}{a}$ on this scale, we have only to state the analogy $m-1-u\,(m'-1) : 1=\frac{1}{a} : \frac{1}{A}$, and A is the radius of our first surface measured on a scale of which P is the unit.

If, in the formula which expresses the final equation for $\frac{1}{a}$, the value of t should be positive, and greater than $\frac{1}{4}s^2$, the equation has imaginary roots; and it is not possible with the glasses employed, and the conditions assumed, to correct both the chromatic and spherical aberrations.

If t is negative and equal to $\frac{1}{4}s^2$, the radical part of the value is $=0$, and $\frac{1}{a}=-\frac{1}{2}s$. But if it be negative or positive, but less than $\frac{1}{4}s^2$, the equation has two real roots, which will give two constructions. That is to be preferred which gives the smallest curvature of the surfaces; because, since in our formulæ which determine the spherical aberration some quantities are neglected, these quantities are always greater when a large arch (that is, an arch of many degrees) is employed. No radius should be admitted which is much less than $\frac{1}{3}$ of the focal distance.

All this process will be made plain and easy by an example.

Very careful experiments have shown, that in common crown-glass the sine of incidence is to the sine of refraction as 1.526 is to 1, and that in the generality of flint-glass it is as 1.604 to 1. Also that $\frac{dm}{dm'}=0.6054$ $=u$. Therefore $m-1=0.526$; $m'-1=0.604$; $e=\frac{m-1}{m'-1}=0.87086$. By these numbers we can compute the coefficients of our final equation. We shall find them as follows:

$$A=2.012$$
$$B=3.529$$
$$C=1.360$$
$$D=-0.526$$
$$E=1.8659$$

The general equation (p. 252. col. 2. lin. 8.), when subjected to the assumed coincidence of the internal surfaces, is $\frac{A-C}{a^2}-\frac{B+D-2C}{a}+E+D-C=0$. $A-C$ is $=0.652$; $B+D-2C$ is $=0.283$; and $E+D-C$ is $=-0.020$; and the equation with numerical coefficients is $\frac{0.652}{a^2}-\frac{0.283}{a}-0.020=0$, which corresponds to the equation $px^2+qx+r=0$. We must now make $s=\frac{q}{p}$, $=\frac{0.283}{0.652}$, $=0.434$, and $t=\frac{r}{p}$, $=\frac{0.02}{0.652}$, $=0.0307$. This gives us the final quadratic equation $\frac{1}{a^2}-\frac{0.434}{a}$ $-0.0307=0$. To solve this, we have $-\frac{1}{2}s=0.217$, and $\frac{1}{4}s^2=0.0471$. From this take t, which is $=-0.0307$ (that is, to 0.0471 add 0.0307), and we obtain 0.0778, the square root of which is $=0.2789$. Therefore, finally, $\frac{1}{a}=0.2170\pm0.2789$, which is either 0.4959 or -0.0619. It is plain that the first must be preferred, because the second gives a negative radius, or makes the first surface of the crown-glass concave. Now as the convergence of the rays is to be produced by the crown-glass, the other surface must become very convex, and occasion great errors in the computed aberration. We therefore retain 0.4959 for the value of $\frac{1}{a}$, and a is $=\frac{1}{0.4959}$, $=2.0166$.

To obtain b, use the equation $\frac{1}{b}=\frac{1}{a}-1$, which gives $\frac{1}{b}=-0.5041$, and therefore a convex surface. b is therefore $=\frac{1}{0.5041}=1.9837$.

a' is the same with b, and $\frac{1}{a'}=-0.5041$.

To obtain b', use the equation $\frac{1}{b'}=\frac{1}{a'}+u$. Now $u=$ 0.6054, and $\frac{1}{a'}=-0.5041$. The sum of these is

0.1013;

0.1013; and since it is positive, the surface is concave.

$$b' = \frac{1}{.1013} = 9.872.$$

Lastly, $\frac{1}{P} = m - 1 - u\,(m' - 1) = 0.1603$, and $P = \frac{1}{0.1603}, = 0.2383$.

Now to obtain all the measures in terms of the focal distance P, we have only to divide the measures already found by 6.2383, and the quotients are the measures wanted.

$$\text{Therefore } a = \frac{2.0166}{6.2383} = 0.32325$$
$$b = \frac{1.9837}{6.2383} = -0.31798$$
$$a' = \text{ - - } = -0.31798$$
$$b' = \frac{9.872}{6.2383} = 1.5825$$
$$P = \text{ - } 1.$$

If it be intended that the focal distance of the object-glass shall be any number n of inches or feet, we have only to multiply each of the above radii by n, and we have their lengths in inches or feet.

Thus we have completed the investigation of the construction of a double object-glass. Although this was intricate, the final result is abundantly simple for practice, especially with the assistance of logarithms. The only troublesome thing is the preparation of the numerical coefficients A, B, C, D, E of the final equation. Strict attention must also be paid to the positive and negative signs of the quantities employed.

We might propose other conditions. Thus it is natural to prefer for the first or crown-glass lens such a form as shall give it the smallest possible aberration. This will require a small aberration of the flint-glass to correct it. But a little reflection will convince us that this form will not be good. The focal distance of the crown-glass must not exceed one-third of that of the compound glass; these two being nearly in the proportion of $d\,m' - d\,m$ to $d\,m'$. Therefore if this form be adopted, and a be made about $\frac{1}{3}$th of b, it will not exceed $\frac{1}{9}$th of P. Therefore, although we may produce a most accurate union of the central and marginal rays by opposite aberrations, there will be a considerable aberration of some rays which are between the centre and the margin.

It is absolutely impossible to collect into one point the whole rays (though the very remotest rays are united with the central rays), except in a very particular case, which cannot obtain in an object-glass; and the small quantities which are neglected in the formula which we have given for the spherical aberration, produce errors which do not follow any proportion of the aperture which can be expressed by an equation of a manageable form. When the aperture is very large, it is better not to correct the aberration for the whole aperture, but for about $\frac{5}{6}$ths of it. When the rays corresponding to this distance are made to coincide with the central rays by means of opposite aberrations, the rays which are beyond this distance will be united with some of those which are nearer to the centre, and the whole diffusion will be considerably diminished. Dr Smith has illustrated this in a very perspicuous manner in his theory of his Catoptric Microscope.

But although we cannot adopt this form of an object-glass, there may be other considerations which may lead us to prefer some particular form of the crown-glass, or of the flint-glass. We shall therefore adapt our general equation $\frac{A}{a^2} - \frac{B}{a} - \frac{C}{a'^2} - \frac{D}{a'} + E = 0$ to this condition.

Therefore let h express this selected ratio of the two radii of the crown-glass, making $\frac{a}{b} = h$ (remembering always that a is positive and b negative in the case of a double convex, and h is a negative number).

With this condition we have $\frac{1}{b} = \frac{h}{a}$. But when we make n the unit of our formula of aberration, $\frac{1}{b} = \frac{1}{a} - 1$. Therefore $1 = \frac{1}{a} - \frac{h}{a}$, and $\frac{1}{a} = \frac{1}{1-h}$. Now substitute this for $\frac{1}{a}$ in the general equation, and change all the signs (which still preserves it $= 0$), and we obtain

$$\frac{C}{a'^2} + \frac{D}{a'} - E - \frac{A}{(1-h)^2} + \frac{B}{1-h} = 0.$$

By this equation we are to find $\frac{1}{a'}$, or the radius of the anterior surface of the flint-glass. The equation is of this form $p\,x^2 + q\,x + r = 0$, and we must again make $s = \frac{q}{p}$ and $t = \frac{r}{p}$. Therefore $s = \frac{D}{C}$, and $t = \frac{1}{C} \times \left(\frac{B}{1-h} - \frac{A}{(1-h)^2} - E\right)$. Then, finally,

$$\frac{1}{a'} = -\tfrac{1}{2}\,s \pm \sqrt{\tfrac{1}{4}\,s^2 - t}.$$

It may be worth while to take a particular case of this condition. Suppose the crown-glass to be of equal convexities on both sides. This has some advantages: We can tell with precision whether the curvatures are precisely equal, by measuring the focal distance of rays reflected back from its posterior surface. These distances will be precisely equal. Now it is of the utmost importance in the construction of an object-glass which is to correct the spherical aberration, that the forms be precisely such as are required by our formulæ.

In this case of a lens equally convex on both sides $\frac{1}{a}$ is $= -\frac{1}{b}, = \frac{1}{2}$. Substitute this value for $\frac{1}{a}$ in the general equation $\frac{A}{a^2} - \frac{B}{a} - \frac{C}{a'^2} - \frac{D}{a'} + E = 0$, and then $\frac{A}{a^2} = \frac{A}{4}$; $\frac{B}{a}$ becomes $\frac{B}{2}$. Now change all the signs, and we have $\frac{C}{a'^2} + \frac{D}{a'} - E - \frac{A}{4} + \frac{B}{2} = 0$, by which we are to find a'. This in numbers is $\frac{1.360}{a'^2} - \frac{0.526}{a'}$

Telescope. $\frac{0.526}{a'} - 0.6044 = 0$. Then $s = \frac{-0.526}{1.360}$, $= 0.3867$, and $t = \frac{-0.6044}{1.360}$, $= -0.4444$. Then $-\frac{1}{2}s = 0.1933$; $\frac{1}{4}s^2 = 0.0374$; and $\sqrt{\frac{1}{4}S^2 - t} = \pm 0.6941$; so that $\frac{1}{a'} = 0.1933 \pm 0.6941$. This gives two real roots, viz. 0.8874, and -0.5008. If we take the first, we shall have a convex anterior surface for the flint-glass, and consequently a very deep concave for the posterior surface. We therefore take the second or negative root -0.5008.

We find $\frac{1}{b'}$, as before, by the equation $\frac{1}{b'} = \frac{1}{a'} + u$, $= 0.1046$, which will give a large value of b'.

We had $\frac{1}{a} = \frac{1}{2}$

and $\frac{1}{b} = -\frac{1}{2}$

and $\frac{1}{P}$ is the same as in the former case, viz, 0.1603.

Having all these reciprocals, we may find a, b, a', b', and P; and then dividing them by P, we obtain finally

$$a = 0.3206$$
$$b = -0.3206$$
$$a' = -0.3201$$
$$b' = 1.533$$
$$P = 1.$$

By comparing this object-glass with the former, we may remark, that diminishing a a little increases b, and in this respect improves the lens. It indeed has diminished b', but this being already considerable, no inconvenience attends this diminution. But we learn, at the same time, that the advantage *must* be very small; for we cannot diminish a much more, without making it as small as the smallest radius of the object-glass. This proportion is therefore very near the maximum, or best possible; and we know that in such cases, even considerable changes in the radii will make but small changes in the result: for these reasons we are disposed to give a strong preference to the first construction, on account of the other advantages which we showed to attend it.

As another example, we may take a case which is very nearly the general practice of the London artists. The radius of curvature for the anterior surface of the convex crown-glass is $\frac{5}{6}$ths of the radius of the posterior surface, so that $h = \frac{5}{6}$. This being introduced into the determinate equation, gives

$$a = 0.2938 \qquad a' = -0.3443$$
$$b = -0.3526 \qquad b = 1.1474$$

As another condition, we may suppose that the second or flint-glass is of a determined form.

This case is solved much in the same manner as the former. Taking h to represent the ratio of a' and b', we have $\frac{1}{a'} = \frac{1}{1-h}$. This value being substituted in the general equation $\frac{A}{a^2} - \frac{B}{a} - \frac{C}{a'^2} - \frac{D}{a} + E = 0$, gives us $\frac{A}{a^2} - \frac{B}{a} + E - \frac{C}{(1-h)^2} - \frac{D}{1-h} = 0$. This gives for the final equation $x^2 + sx + t = 0$, $s = \frac{B}{A}$, and $t = \frac{1}{A} \times \left(E - \frac{C}{(1-h)^2} - \frac{D}{1-h}\right)$ and $\frac{1}{a} = -\frac{1}{2}\frac{1}{2}s \pm \sqrt{\frac{1}{4}s^2 - t}$. Telescope.

We might here take the particular case of the flint-glass being equally concave on both sides. Then because $\frac{1}{n'} = -u$, and in the case of equal concavities $\frac{2}{a'} = \frac{1}{n'}$, $= -u$, it is sufficient to put $-\frac{1}{2}u$ for $\frac{1}{a'}$. This being done, the equation becomes $\frac{A}{a} - \frac{B}{a}\frac{Cu^2}{4} + \frac{Du}{2} + E = 0$. This gives $s = \frac{B}{A}$, and $t = \frac{1}{A} \times \left(\frac{4Du - 2Cu^2}{8} + E\right)$.

We imagine that these cases are sufficient for showing the management of the general equation; and the example of the numerical solution of the first case affords instances of the only niceties which occur in the process, viz. the proper employment of the positive and negative quantities.

We have oftener than once observed, that the formula is not perfectly accurate, and that in very large apertures errors will remain. It is proper therefore, when we have obtained the form of a compound object-glass, to calculate trigonometrically the progress of the light through it; and if we find a considerable aberration, either chromatic or spherical, remaining, we must make such changes in the curvatures as will correct them. We have done this for the first example; and we find, that if the focal distance of the compound object-glass be 100 inches, there remains of the spherical aberration nearly $\frac{1}{60}$th of an inch, and the aberration of colour is over corrected above $\frac{1}{9}$th of an inch. The first aberration has been diminished about 6 times, and the other about 30 times. Both of the remaining errors will be diminished by increasing the radius of the inner surfaces. This will diminish the aberration of the crown-glass, and will diminish the dispersion of the flint more than that of the crown. But indeed the remaining error is hardly worth our notice.

It is evident to any person conversant with optical discussions, that we shall improve the correction of the spherical aberration by diminishing the refractions. If we employ two lenses for producing the convergency of the rays to a real focus, we shall reduce the aberration to $\frac{1}{4}$th. Therefore a better achromatic glass will be formed of three lenses, two of which are convex and of crown-glass. The refraction being thus divided between them, the aberrations are lessened. There is no occasion to employ two concave lenses of flint-glass; there is even an advantage in using one. The aberration being considerable, less of it will serve for correcting the aberration of the crown-glass, and therefore such a form may be selected as has little aberration. Some light is indeed lost by these two additional surfaces; but this is much more than compensated by the greater apertures which we can venture to give when the curvature of the surface is so much diminished. We proceed therefore to

The Construction of a Triple Achromatic Object-glass.

It is plain that there are more conditions to be assumed

Telescope. sumed before we can render this a determinate problem, and that the investigation must be more intricate. At the same time, it must give us a much greater variety of constructions, in consequence of our having more conditions necessary for giving the equation this determinate form. Our limits will not allow us to give a full account of all that may be done in this method. We shall therefore content ourselves with giving one case, which will sufficiently point out the method of proceeding. We shall then give the results in some other eligible cases, as rules to artists by which they may construct such glasses.

Let the first and second glasses be of equal curvatures on both sides; the first being a double convex of crown-glass, and the second a double concave of flint-glass.

Still making n the unit of our calculus, we have in the first place $a = -b, = -a', = b'$. Therefore $\frac{1}{a'} - \frac{1}{b'} = -\left(\frac{1}{a} - \frac{1}{b}\right)$, or $\frac{1}{n'} = -\frac{1}{n} = -1$. Therefore the equation $\frac{dm}{n} + \frac{dm'}{n'} + \frac{dm''}{n''} = 0$ becomes $u - 1 + \frac{u}{n''} = 0$, or $\frac{1}{n} = \frac{1}{u} - 1$. Let us call this value u'.

We have $\frac{1}{p} = m - 1$; $\frac{1}{p'} = -(m' - 1)$; $\frac{1}{p''} = u'(m-1)$; $\frac{1}{P} = \frac{1}{p} + \frac{1}{p'} + \frac{1}{p''}, = m - m' + u'(m-1)$. And if we make $m' - m = C$, we shall have $\frac{1}{P} = -C, + u'(m=1)$. Also $\frac{1}{r'} = m - 1$; $\frac{1}{r''} = m - 1 - (m' - 1), = m - m', = -C'$.

The equality of the two curvatures of each lens gives $\frac{1}{a} = \frac{1}{2n}$. Therefore $\frac{1}{a} = -\frac{1}{b}, = -\frac{1}{a'}, = \frac{1}{b'} = \frac{1}{2}$; and $\frac{1}{b''} = \frac{1}{a''} - \frac{1}{n''}, = \frac{1}{a''} - u'$.

Substituting these values in the equation (p. 252. col. 2. par. 1.), we obtain the three formulæ.

1. $\quad c m^2 - \frac{1}{2} c (2m+1) + \frac{c(m+2)}{4m}$

2. $-m' 2 + \frac{1}{2}(2m'+1) - \frac{m'+2}{4m'} + (3m'+1)(m-1) - \frac{2(m'+1)(m-1)}{m'} - \frac{(3m'+2)(m-1)^2}{m'}$

3. $c u' 3 m^2 - \frac{c u'^2 (2m+1)}{a''} + \frac{c u'(m+2)}{m a''^2} - c c' u'^2 (3m+1) + \frac{4 c c' u'(m+1)}{m a''} + \frac{c c'^2 u'(3m+2)}{m} = 0.$

Now arrange these quantities according as they are coefficients of $\frac{1}{a''^2}$ and of $\frac{1}{a''}$, or independent quantities. Let the coefficient of $\frac{1}{a''^2}$ be A, that of $\frac{1}{a''}$ be B, and the independent quantity be C, we have

$$A = \frac{c u'(m+2)}{m}; \quad B = c u'^2 (2m+1) - \frac{4 c c' u'(m+1)}{m},$$

and $C = c m^2 + \frac{c(m+2)}{4m} + \frac{1}{2}(2m'+1) + (3m'+1)(m-1) + c u'^3 m^2 + \frac{c c'^2 u'(3m+2)}{m} - \frac{1}{2} c (2m+1) - m'^2 - \frac{m'+2}{4m} - \frac{2(m'+1)(m-1)}{m'} - \frac{(3m'+2)(m-1)^2}{m'} - c c' u'^2 (3m+1)$.

Our equation now becomes $\frac{A}{a''^2} - \frac{B}{a''} + C = 0$.

This reduced to numbers, by computing the values of the coefficients, is $\frac{1.312}{a''^2} - \frac{1.207}{a''} - 0.3257 = 0$.

This, divided by 1.312, gives $s = -0.92$; and $t = -0.2482$; $-\frac{1}{2}s = 0.46$; $\frac{1}{4}s^2 = 0.2116$; and $\sqrt{\frac{1}{4}s^2 - t} = \pm 0.6781$.

And, finally, $\frac{1}{a''} = 0.46 \pm 0.6781$.

This has two roots, viz. 0.2181 and -1.1381. The last would give a small radius, and is therefore rejected.

Now, proceeding with this value of $\frac{1}{a''}$ and the $\frac{1}{n''}$, we get the other radius b'', and then, by means of u', we get the other radius which is common to the four surfaces. Then, by $\frac{1}{P} = \frac{1}{p''} - c'$, we get the value of P.

The radii being all on the scale of which u is the unit, they must be divided by P to obtain their value on the scale which has P for its unit. This will give us

$a = -b, = -a', = b', =$	0.530
$a'' =$	1.215
$b'' =$	-0.3046
$P =$	1.

This is not a very good form, because the last surface has too great curvature.

We thought it worth while to compute the curvatures for a case where the internal surfaces of the lenses coincide, in order to obtain the advantages mentioned on a former occasion. The form is as follows:

The middle lens is a double concave of flint-glass; the last lens is of crown-glass, and has equal curvatures on both sides. The following table contains the dimensions of the glasses for a variety of focal distances. The first column contains the focal distances in inches; the second contains the radii of the first surface in inches; the third contains the radii of the posterior surface of the first lens and anterior surface of the second; and the fourth column has the radii of the three remaining surfaces.

P	a	b, a'	b', a'', b''
12	9.25	6.17	12.75
24	18.33	12.25	25.5
36	27.33	18.25	38.17
48	36.42	24.33	50.92
60	45.42	30.33	63.58
72	54.5	36.42	76.33
84	63.5	42.5	89.
96	72.6	48.5	101.75
108	81.7	54.58	114.42
120	90.7	60.58	127.17

We have had an opportunity of trying glasses of this construction, and found them equal to any of the same length, although executed by an artist by no means excellent in his profession as a glass-grinder. This very circumstance

Telescope. circumstance gave us the opportunity of seeing the good effects of interposing a transparent substance between the glasses. We put some clear turpentine varnish between them, which completely prevented all reflection from the internal surfaces. Accordingly these telescopes were surprisingly bright; and although the roughness left by the first grinding was very perceptible by the naked eye before the glasses were put together, yet when joined in this manner it entirely disappeared, even when the glasses were viewed with a deep magnifier.

The aperture of an object-glass of this construction of 30 inches focal distance was $3\frac{1}{8}$th inches, which is considerably more than any of Mr Dollond's that we have seen.

If we should think it of advantage to make all the three lenses isosceles, that is, equally curved on both surfaces, the general equation will give the following radii:

$$a = +0.639 \quad a' = -0.5285 \quad a'' = +0.6413$$
$$b = -0.639 \quad b' = +0.5285, \quad b'' = -0.6413$$

This seems a good form, having large radii.

Should we choose to have the two crown-glass lenses isosceles and equal, we must make

$$a = +0.6412 \quad a' = -0.5227 \quad a'' = +0.6412$$
$$b = -0.6412 \quad b' = +0.5367 \quad b'' = -0.6412$$

This form hardly differs from the last.

Our readers will recollect that all these forms proceed on certain measures of the refractive and dispersive powers of the substances employed, which are expressed by m, m', dm, and dm': and we may be assured that the formulæ are sufficiently exact, by the comparison (which we have made in one of the cases) of the result of the formula and the trigonometrical calculation of the progress of the rays. The error was but $\frac{1}{60}$th of the whole, ten times less than another error, which unavoidably remains, and will be considered presently. These measures of refraction and dispersion were carefully taken; but there is great diversity, particularly in the flint-glass. We are well informed that the manufacture of this article has considerably changed of late years, and that it is in general less refractive and less dispersive than formerly. This must evidently make a change in the forms of achromatic glasses. The proportion of the focal distance of the crown-glasses to that of the flint must be increased, and this will occasion a change in the curvatures, which shall correct the spherical aberration. We examined with great care a parcel of flint-glass which an artist of this city got lately for the purpose of making achromatic object-glasses, and also some very white crown glass made in Leith; and we obtained the following measures:

$$m = 1.529 \qquad \frac{dm}{dm'} = \frac{142}{219} = 0.64841.$$
$$m' = 1.578$$

We computed some forms for triple object glasses made of these glasses, which we shall subjoin as a specimen of the variations which this change of data will occasion.

If all the three lenses are made isosceles, we have

$$a = +0.796 \quad a' = -0.474 \quad a'' = +0.502$$
$$b = -0.796 \quad b' = +0.474 \quad b'' = -0.502$$

Or

$$a = 0.504 \quad a' = -0.475 \quad a'' = +0.793$$
$$b = -0.504 \quad b' = 0.475 \quad b'' = -0.793$$

If the middle lens be isosceles, the two crown-glass lenses may be made of the same form and focal distance, and placed the same way. This will give us

$$a = +0.705 \quad a' = -0.475 \quad a'' = +0.705$$
$$b = -0.547 \quad b' = +0.475 \quad b'' = -0.547$$

N. B. This construction allows a much better form, if the measures of refraction and dispersion are the same that we used formerly. For we shall have

$$a = +0.628 \quad a' = -0.579 \quad a'' = +0.628$$
$$b = -0.749 \quad b' = +0.579 \quad b'' = -0.749$$

And this is pretty near the practice of the London opticians.

We may here observe, upon the whole, that an amateur has little chance of succeeding in these attempts. The diversity of glasses, and the uncertainty of the workman's producing the very curvatures which he intends, is so great, that the object-glass turns out different from our expectation. The artist who makes great numbers acquires a pretty certain guess at the remaining error; and having many lenses, intended to be of one form, but unavoidably differing a little from it, he tries several of them with the other two, and finding one better than the rest, he makes use of it to complete the set.

The great difficulty in the construction is to find the exact proportion of the dispersive powers of the crown and flint-glass. The crown is pretty constant; but there are hardly two pots of flint-glass which have the same dispersive power. Even if constant, it is difficult to measure it accurately; and an error in this greatly affects the instrument, because the focal distances of the lenses must be nearly as their dispersive powers. The method of examining this circumstance, which we found most accurate, was as follows:

The sun's light, or that of a brilliant lamp, passed through a small hole in a board, and fell on another board pierced also with a small hole. Behind this was placed a fine prism A (fig. 14.), which formed a spectrum ROV on a screen pierced with a small hole. Behind this was placed a prism B of the substance under examination. The ray which was refracted by it fell on the wall at D, and the distance of its illumination from that point to C, on which an unrefracted ray would have fallen, was carefully measured. This showed the refraction of that colour. Then, in order that we might be certain that we always compared the refraction of the same precise colour by the different prisms placed at B, we marked the precise position of the prism A when the ray of a particular colour fell on the prism B. This was done by an index AG attached to A, and turning with it, when we caused the different colours of the spectrum formed by A to fall on B. Having examined one prism B with respect to all the colours in the spectrum formed by A, we put another B in its place. Then bringing A to all its former positions successively, by means of a graduated arch HGK, we were certain that when the index was at the same division of the arch it was the very ray which had been made to pass through the first prism B in a former experiment. We did not solicitously endeavour to find the very extreme red and violent rays; because, although we did not learn the whole dispersions of the two prisms, we learned their proportions, which is the circumstance wanted in the construction of achromatic glasses. It is in vain to attempt this by measuring the spectrums themselves; for we cannot be certain of selecting

Fig. 14.

Telescope. selecting the very same colours for the comparison, because they succeed in an insensible gradation.

The intelligent reader will readily observe, that we have hitherto proceeded on the supposition, that when, by means of contrary refractions, we have united the extreme red and violet rays, we have also united all the others. But this is quite gratuitous. Sir Isaac Newton would, however, have made the same supposition; for he imagined that the different colours divided the spectrum formed by all substances in the proportions of a musical canon. This is a mistake. When a spectrum is formed by a prism of crown glass, and another of precisely the same length is formed by the side of it by a prism of flint-glass, the confine between the green and blue will be found precisely in the middle of the first spectrum, but in the second it will be considerably nearer to the red extremity. In short, different substances do not disperse the colours in the same proportion.

The effect of this irrationality (so to call it) of dispersion, will appear plainly, we hope, in the following manner: Fig. 12. Let A (fig. 12.) represent a spot of white solar light falling perpendicularly on a wall. Suppose a prism of common glass placed behind the hole through which the light is admitted, with its refracting angle facing the left hand. It will refract the beam of light to the right, and will at the same time disperse this heterogeneous light into its component rays, carrying the extreme red ray from A to R, the extreme orange from A to O, the extreme yellow from A to Y, &c. and will form the usual prismatic spectrum ROYGBPVC. If the whole length RC be divided into 1000 parts, we shall have (when the whole refraction AR is small) RO very nearly 125, RY=200, RG=333, RB=500, RP=667, RV=778, and RC=1000; this being the proportion observed in the differences of the sines of refraction by Sir Isaac Newton.

Perhaps a refracting medium may be found such, that a prism made of it would refract the white light from A′, in the upper line of this figure, in such a manner that a spectrum R′O′Y′G′B′P′V′C′ shall be formed at the same distance from A′, and of the same length, but divided in a different proportion. We do not know that such a medium has been found; but we know that a prism of flint-glass has its refractive and dispersive powers so constituted, that if A′H′ be taken about one-third of AR, a spot of white light, formed by rays falling perpendicularly at H′, will be so refracted and dispersed, that the extreme red ray will be carried from H′ to R′, and the extreme violet from H′ to C′, and the intermediate colours to intermediate points, forming a spectrum resembling the other, but having the colours more constipated towards R′, and more dilated towards C; so that the ray which the common glass carried to the middle point B of the spectrum RC is now in a point B′ of the spectrum R′C′, considerably nearer to R′.

Dr Blair has found, on the other hand, that certain fluids, particularly such as contain the muriatic acid, when formed into a prism, will refract the light from H″ (in the lower line) so as to form a spectrum R″C″ equal to RC, and as far removed from A″ as RC is from A, but having the colours more dilated toward R″, and more constipated toward C, than is observed in RC; so that the ray which was carried by the prism of common glass to the middle point B is carried to a point B″, considerably nearer to C″. Telescope.

Let us now suppose that, instead of a white spot at A, we have a prismatic spectrum AB (fig. 13.), and that the prism of common glass is applied as before, immediately behind the prism which forms the spectrum AB. We know that this will be refracted sidewise, and will make a spectrum ROYGBPC, inclined to the plane of refraction in an angle of 45°; so that drawing the perpendicular RC′, we have RC′=C′C. Fig. 13.

We also know that the prism of flint-glass would refract the spectrum formed by the first prism on EHF, in such a manner that the red ray will go to R, the violet to C, and the intermediate rays to points *o*, *y*, *g*, *b*, *p*, *v*, so situated that O′*o* is = R′O′ of the other figure; Y*y* is = R′Y′ of that figure, G*g* = R′G′, &c. These points must therefore lie in a curve R*oygbpv*C, which is convex toward the axis R′C′.

In like manner we may be assured that Dr Blair's fluid will form a spectrum R*o′y′g′b′p′v′*C, concave toward R′C.

Let it be observed by the way, that this is a very good method for discovering whether a medium disperses the light in the same proportion with the prism which is employed for forming the first spectrum AB or EF. It disperses in the same or in a different proportion, according as the oblique spectrum is straight or crooked; and the exact proportion corresponding to each colour is had by measuring the ordinates of the curves R*b*C or R*b′*C

Having formed the oblique spectrum RBC by a prism of common glass, we know that an equal prism of the same glass, placed in a contrary position, will bring back all the rays from the spectrum RBC to the spectrum AB, laying each colour on its former place.

In like manner, having formed the oblique spectrum R*b*C by a prism of flint-glass, we know that another prism of flint-glass, placed in the opposite direction, will bring all the rays back to the spectrum EHF.

But having formed the oblique spectrum RBC by a prism of common glass, if we place the flint-glass prism in the contrary position, it will bring the colour R back to E, and the colour C to F; but it will not bring the colour B to H, but to a point *h*, such that B*h* is equal to *b*H, and *b*B to *h*H. In like manner, the other colours will not be brought back to the straight line EHF, but to a curve E*h*F, forming a crooked spectrum.

In like manner, the fluids discovered by Dr Blair, when employed to bring back the oblique spectrum RBC formed by common glass, will bring its extremities back to E and F, and form the crooked spectrum E*h′*F lying beyond EHF.

This experiment evidently gives us another method for examining the proportionality of the dispersion of different substances.

Having, by common glass, brought back the oblique spectrum formed by common glass to its natural place AB, suppose the original spectrum at AB to contract gradually (as Newton has made it do by means of a lens), it is plain that the oblique spectrum will also contract, and so will the second spectrum at AB; and it will at last coalesce into a white spot. The effect will be equivalent to a gradual compression of the whole figure

Telescope. figure, by which the parallel lines AR and BC gradually approach, and at last unite.

In like manner, when the oblique spectrum formed by flint-glass is brought back to EHF by a flint-glass prism, and the figure compressed in the same gradual manner, all the colours will coalesce into a white spot.

But when flint-glass is employed to bring back the oblique spectrum formed by common glass, it forms the crooked spectrum E *h* F. Now let the figure be compressed. The curve E *h* F will be doubled down on the line H *h*, and there will be formed a compound spectrum H *h*, quite unlike the common spectrum, being purple or claret coloured at H by the mixture of the extreme red and violet, and green edged with blue at *h* by the mixture of the green and blue. The fluid prisms would in like manner form a spectrum of the same kind on the other side of H.

This is precisely what is observed in achromatic object-glasses made of crown-glass and flint: for the refraction from A to R corresponds to the refraction of the convex crown-glass; and the contrary refraction from R to E corresponds to the contrary refraction of the concave flint-glass, which still leaves a part of the first refraction, producing a convergence to the axis of the telescope. It is found to give a purple or wine-coloured focus, and within this a green one, and between these an imperfect white. Dr Blair found, that when the eye-glass was drawn out beyond its proper distance, a star was surrounded by a green fringe, by the green end of the spectrum, which crossed each other within the focus; and when the eye-glass was too near the object-glass, the star had a wine-coloured fringe. The green rays were ultimately most refracted. *N. B.* We should expect the fringe to be of a blue colour rather than a green. But this is easily explained: The extreme violet rays are very faint, so as hardly to be sensible; therefore when a compound glass is made as achromatic as possible to our senses, in all probability (nay certainly) these almost insensible violet rays are left out, and perhaps the extreme colours which are united are the red and the middle violet rays. This makes the green to be the mean ray, and therefore the most outstanding when the dispersions are not proportional.

Dr Blair very properly calls these spectrums, H *h* and H *h'*, *secondary spectrums*, and seems to think that he is the first who has taken notice of them. But Mr Clairault was too accurate a mathematician, and too careful an observer, not to be aware of a circumstance which was of primary consequence to the whole inquiry. He could not but observe that the success rested on this very particular, and that the proportionality of dispersion was indispensably necessary.

This subject was therefore touched on by Clairault; and *fully* discussed by Boscovich, first in his Dissertations published at Vienna in 1759; then in the *Comment. Bononiensis*; and, lastly, in his *Opuscula*, published in 1785. Dr Blair, in his ingenious Dissertation on Achromatic Glasses, read to the Royal Society of Edinburgh in 1793, seems not to have known of the labours of these writers; speaks of it as a new discovery; and exhibits some of the consequences of this principle in a singular point of view, as something very paradoxical and inconsistent with the usually received notions on these subjects. But they are by no means so. We are, however, much indebted to his ingenious researches, and his successful endeavours to find some remedy for this imperfection of achromatic glasses. Some of his contrivances are exceedingly ingenious; but had the Doctor consulted these writers, he would have saved himself a good deal of trouble.

Boscovich shows how to unite the two extremes with the most outstanding colour of the secondary spectrum, by means of a third substance. When we have done this, the aberration occasioned by the secondary spectrums must be prodigiously diminished; for it is evidently equivalent to the union of the points H and *h* of our figure. Whatever cause produces this must diminish the curvature of the arches E *h* and *h* F: but even if these curvatures were not diminished, their greatest ordinates cannot exceed one-fourth of H *h*; and we may say, without hesitation, that by uniting the mean or most outstanding ray with the two extremes, the remaining dispersion will be as much less than the uncorrected colour of Dollond's achromatic glass, as this is less than four times the dispersion of a common object-glass. It must therefore be altogether insensible.

Boscovich asserts, that it is not possible to unite more than two colours by the opposite refraction of two substances, which do not disperse the light in the same proportions. Dr Blair makes light of this assertion, as he finds it made in general terms in the vague and paltry extract made by Priestley from Boscovich in his Essay on the History of Optics; but had he read this author in his own dissertations, he would have seen that he was perfectly right. Dr Blair, however, has hit on a very ingenious and effectual method of producing this union of three colours. In the same way as we correct the dispersion of a concave lens of crown-glass by the opposite dispersion of a concave lens of flint-glass, we may correct the secondary dispersion of an achromatic convex lens by the opposite secondary dispersion of an achromatic concave lens. But the intelligent reader will observe, that this union does not contradict the assertion of Boscovich, because it is *necessarily* produced by means of three refracting substances.

The most essential service which the public has received at the hands of Dr Blair is the discovery of fluid mediums of a proper dispersive power. By composing the lenses of such substances, we are at once freed from the irregularities in the refraction and dispersion of flint-glass, which the chemists have not been able to free it from. In whatever way this glass is made, it consists of parts which differ both in refractive and dispersive power; and when taken up from the pot, these parts mix in threads, which may be disseminated through the mass in any degree of fineness. But they still retain their properties; and when a piece of flint-glass has been formed into a lens, the eye, placed in its focus, sees the whole surface occupied by glistening threads or broader veins running across it. Great rewards have been offered for removing this defect, but hitherto to no purpose. We beg leave to propose the following method: Let the glass be reduced to powder, and then melted with a great proportion of alkaline salt, so as to make a liquor silicum. When precipitated from this by an acid, it must be in a state of very uniform composition. If again melted into glass, we should hope that it would be free from this defect; if not, the case seems to be desperate.

But by using a fluid medium, Dr Blair was freed from all this embarrassment; and he acquired another

Telescope. immenſe advantage, that of adjuſting at pleaſure both the refractive and diſperſive powers of his lenſes. In ſolid lenſes, we do not know whether we have taken the curvatures ſuited to the refractions till our glaſs is finiſhed; and if we have miſtaken the proportions, all our labour is loſt. But when fluids are uſed, it is enough that we know nearly the refractions. We ſuit our focal diſtances to theſe, and then ſelect our curvatures, ſo as to remove the aberration of figure, preſerving the focal diſtances. Thus, by properly tempering the fluid mediums, we bring the lens to agree preciſely with the theory, perfectly achromatic, and the aberration of figure as much corrected as is poſſible.

Dr Blair examined the refractive and diſperſive powers of a great variety of ſubſtances, and found great varieties in their actions on the different colours. This is indeed what every well informed naturaliſt would expect. There is no doubt now among naturaliſts about the mechanical connection of the phenomena of nature; and all are agreed that the chemical actions of the particles of matter are perfectly like in kind to the action of gravitating bodies; that all theſe phenomena are the effects of forces like thoſe which we call attractions and repulſions, and which we obſerve in magnets and electrified bodies; that light is refracted by forces of the ſame kind, but differing chiefly in the ſmall extent of their ſphere of activity. One who views things in this way will expect, that as the actions of the ſame acid for the different alkalies are different in degree, and as the different acids have alſo different actions on the ſame alkali, in like manner different ſubſtances differ in their general refractive powers, and alſo in the proportion of their action on the different colours. Nothing is more unlikely therefore than the proportional diſperſion of the different colours by different ſubſtances; and it is ſurpriſing that this inquiry has been ſo long delayed. It is hoped that Dr Blair will oblige the public with an account of the experiments which he has made. This will enable others to co-operate in the improvement of achromatic glaſſes. We cannot derive much knowledge from what he has already publiſhed, becauſe it was chiefly with the intention of giving a popular, though not an accurate, view of the ſubject. The conſtructions which are there mentioned are not thoſe which he found moſt effectual, but thoſe which would be moſt eaſily underſtood, or demonſtrated by the ſlight theory which is contained in the diſſertation; beſides, the manner of expreſſing the difference of refrangibility, perhaps choſen for its paradoxical appearance, does not give us a clear notion of the characteriſtic differences of the ſubſtances examined. Thoſe rays which are ultimately moſt deflected from their direction, are ſaid to have become the moſt refrangible by the combination of different ſubſtances, although, in all the particular refractions by which this effect is produced, they are leſs refracted than the violet light. We can juſt gather this much, that common glaſs diſperſes the rays in ſuch a manner, that the ray which is in the confine of the green and blue occupies the middle of the priſmatic ſpectrum; but in glaſſes, and many other ſubſtances, which are more diſperſive, this ray is nearer to the ruddy extremity of the ſpectrum. While therefore the ſtraight line RC′ (fig. 13.) terminates the ordinates O *o*′, YY′, G *g*′, &c. which repreſent the diſperſion of common glaſs, the ordinates which expreſs the diſperſions of theſe ſubſtances are terminated by a curve paſſing through R and C′, but lying below the line RC′. When therefore parallel heterogenous light is made to converge to the axis of a convex lens of common glaſs, as happens at F in fig. 6. C, the light is diſperſed, and the violet rays have a ſhorter focal diſtance. If we now apply a concave lens of greater diſperſive power, the red and violet rays are brought to one focus F; but the green rays, not being ſo much refracted away from F, are left behind at φ, and have now a ſhorter focal diſtance. But Dr Blair afterwards found that this was not the caſe with the muriatic acid, and ſome ſolutions in it. He found that the ray which common glaſs cauſed to occupy the middle of the ſpectrum was much nearer to the blue extremity when refracted by theſe fluids. Therefore a concave lens formed of ſuch fluids which united the red and violet rays in F′, refracted the green rays to *f*′.

Fig. 13.

Fig. 6.

Having obſerved this, it was an obvious conjecture, that a mixture of ſome of theſe fluids might produce a medium, whoſe action on the intermediate rays ſhould have the ſame proportion that is obſerved on common glaſs; or that two of them might be found which formed ſpectra ſimilarly divided, and yet differing ſufficiently in diſperſive power to enable us to deſtroy the diſperſion by contrary refractions, without deſtroying the whole refraction. Dr Blair accordingly found a mixture of ſolutions of ammoniacal and mercurial ſalts, and alſo ſome other ſubſtances, which produced diſperſions proportional to that of glaſs, with reſpect to the different colours.

And thus has the reſult of this intricate and laborious inveſtigation correſponded to his utmoſt wiſhes. He has produced achromatic teleſcopes which ſeem as perfect as the thing will admit of; for he has been able to give them ſuch apertures, that the *incorrigible* aberration ariſing from the ſpherical ſurfaces becomes a ſenſible quantity, and precludes farther amplification by the eye-glaſſes. We have examined one of his teleſcopes: The focal diſtance of the object-glaſs did not exceed 17 inches, and the aperture was fully $3\frac{1}{2}$ inches. We viewed ſome ſingle and double ſtars and ſome common objects with this teleſcope; and found, that in magnifying power, brightneſs, and diſtinctneſs, it was manifeſtly ſuperior to one of Mr Dollond's of 42 inches focal length. It alſo gave us an opportunity of admiring the dexterity of the London artiſts, who could work the glaſſes with ſuch accuracy. We had moſt diſtinct viſion of a ſtar when uſing an erecting eye-piece, which made this teleſcope magnify more than a hundred times; and we found the field of viſion as uniformly diſtinct as with Dollond's 42 inch teleſcope magnifying 46 times. The intelligent reader muſt admire the nice figuring and centering of the very deep eye-glaſſes which are neceſſary for this amplification.

It is to be hoped that Dr Blair will extend his views to *glaſſes* of different compoſitions, and thus give us object-glaſſes which are ſolid; for thoſe compoſed of fluids have inconveniences which will hinder them from coming into general uſe, and will confine them to the muſeums of philoſophers. We imagine that antimonial glaſſes bid fair to anſwer this purpoſe, if they could be made free of colour, ſo as to tranſmit enough of light. We recommend this diſſertation to the careful peruſal of our readers. Thoſe who have not made themſelves much acquainted with the delicate and abſtruſe theory of aberrations, will find it exhibited in ſuch a popular form

Telescope. form as will enable them to understand its general aim; and the well-informed reader will find many curious indications of inquiries and discoveries yet to be made.

We now proceed to consider the eye-glasses or glasses of telescopes. The proper construction of an eye-piece is not less essential than that of the object-glass. But our limits will not allow us to treat this subject in the same detail. We have already extended this article to a great length, because we do not know of any performance in the English language which will enable our readers to understand the construction of achromatic telescopes; an invention which reflects honour on our country, and has completed the discoveries of our illustrious Newton. Our readers will find abundant information in Dr Smith's Optics concerning the eye-glasses, chiefly deduced from Huyghen's fine theory of aberration (A). At the same time, we must again pay Mr Dollond the merited compliment of saying, that he was the first who made any scientific application of this theory to the compound eye-piece for erecting the object. His eye-pieces of five and six glasses are very ingenious reduplications of Huyghens's eye-piece of two glasses, and would probably have superseded all others, had not his discovery of achromatic object-glasses caused opticians to consider the chromatic dispersion with more attention, and pointed out methods of correcting it in the eye-piece without any compound eye-glasses. They have found that this may be more conveniently done with four eye-glasses, without sensibly diminishing the advantages which Huyghens showed to result from employing many small refractions instead of a lesser number of great ones. As this is a very curious subject, we shall give enough for making our readers fully acquainted with it, and content ourselves with merely mentioning the principles of the other rules for constructing an eye-piece.

Such readers as are less familiarly acquainted with optical discussions will do well to keep in mind the following consequences of the general focal theorem.

Fig. 15. If AB (fig. 15.) be a lens, R a radiant point or focus of incident rays, and a the focus of parallel rays coming from the opposite side; then,

1. Draw the perpendicular $a\,a'$ to the axis, meeting the incident ray in a', and a' A to the centre of the lens. The refracted ray BF is parallel to a' A; for R a' : a' A (= R a : a A) = RB : BF (=RA : AF), which is the focal theorem.

2. An oblique pencil BP b proceeding from any point P which is not in the axis, is collected to the point f, where the refracted ray BF cuts the line PA f drawn from P through the centre of the lens: for P a' : a' A = PB : B f, which is also the focal theorem.

The Galilean telescope is susceptible of so little improvement, that we need not employ any time in illustrating its performance.

The simple astronomical telescope is represented in fig. 16. The beam of parallel rays, inclined to the axis, is made to converge to a point G, where it forms an image of the lowest point of a very distant object. These rays decussating from G fall on the eye-glass; the ray from the lowest point B of the object-glass falls on the eye-glass at b; and the ray from A falls on a; and the ray from the centre O falls on o. These rays are rendered parallel, or nearly so, by refraction through the eye-glass, and take the direction $b\,i'$, o I, $a\,i$. If the eye be placed so that this pencil of parallel rays may enter it, they converge to a point of the retina, and give distinct vision of the lowest point of the object. It appears inverted, because the rays by which we see its lowest point come in the direction which in simple vision is connected with the upper point of an object. They come from above, and therefore are thought to proceed from above. We see the point as if situated in the direction I o. In like manner the eye placed at I, sees the upper point of the object in the direction IP, and its middle in the direction IE. The proper place for the eye is I; if brought much nearer the glass, or removed much farther from it, some, or the whole, of this extreme pencil of rays will not enter the pupil. It is therefore of importance to determine this point. Because the eye requires parallel rays for distinct vision, it is plain that F must be the principal focus of the eye-glass. Therefore, by the common focal theorem, OF : OE = OE : OI, or OF : FE = OE : EI. Telescope. Fig. 16.

The magnifying power being measured by the magnitude of the visual angle, compared with the magnitude of the visual angle with the naked eye, we have $\frac{o\,\mathrm{I}\,p}{o\mathrm{O}p}$, or $\frac{o\,\mathrm{IF}}{o\mathrm{OF}}$ for the measure of the magnifying power. This is very nearly $= \frac{\mathrm{OE}}{\mathrm{EI}}$, or $\frac{\mathrm{OF}}{\mathrm{FI}}$.

As the line OE, joining the centres of the lenses, and perpendicular to their surfaces, is called the axis of the telescope, so the ray OG is called the axis of the cone of light which has the object-glass for its base. This ray is through its whole course the axis of the oblique pencil; and when its course is determined, the amplification, the field of vision, the apertures of the glasses, are all determined. For this purpose we have only to consider the centre of the object-glass as a radical point, and trace the process of a ray from this point through the other glasses: this will be the axis of some oblique pencil.

It is evident, therefore, that the field of vision depends on the breadth of the eye-glass. Should we increase this, the extreme pencil will pass through I, because O and I are still the conjugate foci of the eye-glass.

(A) While we thus repeatedly speak of the theory of spherical aberration as coming from Mr Huyghens, we must not omit giving a due share of the honour of it to Dr Barrow and Mr James Gregory. The first of these authors, in his Optical Lectures delivered at Cambridge, has given every proposition which is employed by Huyghens, and has even prosecuted the matter much further. In particular, his theory of oblique slender pencils is of immense consequence to the perfection of telescopes, by showing the methods for making the image of an extended surface as flat as possible. Gregory, too, has given all the fundamental propositions in his *Optica Promota*. But Huyghens, by taking the subject together, and treating it in a system, has greatly simplified it: and his manner of viewing the principal parts of it is incomparably more perspicuous than the performances of Barrow and Gregory.

Telescope.

glass. On the other hand, the angle resolved on for the extent or field of vision gives the breadth of the eye-glass.

We may here observe, by the way, that for all optical instruments there must be two optical figures considered. The first shows the progress of a pencil of rays coming from one point of the object. The various focuses of this pencil show the places of the different images, real or virtual. Such a figure is formed by the three rays AG *a i*, OG *o* I, BG *b i*.

The second shows the progress of the axes of the different pencils proceeding through the centre of the object-glass. The focuses of this pencil of axes show the places where an image of the object-glass is formed; and this pencil determines the field of vision, the apertures of the lenses, and the amplification or magnifying power. The three rays OG*o*I, OFEI, OHPI, form this figure.

See also fig. 24. where the progress of both sets of pencils is more diversified.

The perfection of a telescope is to represent an object in its proper shape, distinctly magnified, with a great field of vision, and sufficiently bright. But there are limits to all these qualities; and an increase of one of them, for the most part, diminishes the rest. The brightness depends on the aperture of the object-glass, and will increase in the same proportion (because *i i'* will always be to AB in the proportion of EF to FO), till the diameter of the emergent pencil is equal to that of the pupil of the eye. Increasing the object-glass any more, can send no more light into the eye. But we cannot make the emergent pencil nearly so large as this when the telescope magnifies much; for the great aperture of the object-glass produces an indistinct image at GF, and its indistinctness is magnified by the eye-glass.

A great field of vision is incompatible with the true shape of the object; for it is not strictly true that all rays flowing from O are refracted to I. Those rays which go to the margin of the eye-glass cross the axis between E and I; and therefore they cross it at a greater angle than if they passed through I. Now had they really passed through I, the object would have been represented in its due proportions. Therefore since the angles of the marginal parts are enlarged by the aberration of the eye-glass, the marginal parts themselves will appear enlarged, or the object appear distorted. Thus a chess-board viewed through a reading glass appears drawn out at the corners, and the straight lines are all changed into curves, as is represented in fig. 18. Fig. 18.

The circumstance which most peremptorily limits the extent of field is the necessary distinctness. If the vision be indistinct, it is useless, and no other quality can compensate this defect. The distortion is very inconsiderable in much larger angles of vision than we can admit, and is unworthy of the attention paid to it by optical writers. They have been induced to take notice of it, because the means of correcting it in a considerable degree are attainable, and afford an opportunity of exhibiting their knowledge; whereas the indistinctness which accompanies a large field is a subject of most difficult discussion, and has hitherto baffled all their efforts to express by any intelligible or manageable formulæ.

Quæque tractata nitescere posse
Desperat relinquit.

Telescope.

This subject must, however be considered. The image at GF of a very remote object is not a plain surface perpendicular to the axis of the telescope, but is nearly spherical, having O for its centre. If a number of pencils of parallel rays crossing each other in I fall on the eye-glass, they will form a picture on the opposite side, in the focus F. But this picture will by no means be flat, nor nearly so, but very concave towards E. Its exact form is of most difficult investigation. The elements of it are given by Dr Barrow; and we have given the chief of them in the article OPTICS, when considering the foci of infinitely slender pencils of oblique rays. Therefore it is impossible that the picture formed by the object-glass can be seen distinctly in all its parts by the eye-glass. Even if it were flat, the points G and H (fig. 16.) are too far from the eye-glass when the middle F is at the proper distance for distinct vision. When, therefore, the telescope is so adjusted that we have distinct vision of the middle of the field, in order to see the margin distinctly we must push in the eye-glass: and having so done, the middle of the field becomes indistinct. When the field of vision exceeds 12 or 15 degrees, it is not possible by any contrivance to make it tolerably distinct all over; and we must turn the telescope successively to the different parts of the field that we may see them agreeably. Fig. 16.

The cause of this indistinctness is, as we have already said, the shortness of the lateral foci of lateral and oblique pencils refracted by the eye-glass. The oblique pencil *b* G *a*, by which an eye placed at I sees the point G of the image, is a cone of light, having a circular base on the eye-glass; of which circle *a b* is one of the diameters. There is a diameter perpendicular to this, which, in this figure, is represented by the point *o*. Fig. 17. represents the base of the cone as seen by an eye placed in the axis of the telescope, with the object-glass as appearing behind it. The point *b* is formed by a ray which comes from the lowest point B of the object-glass, and the point *a* is illuminated by a ray from A. The point *c* at the right hand of the circular base of this cone of light came from the point C on the left side of the object-glass; and the light comes to *d* from D. Now the laws of optics demonstrate, that the rays which come through the points *c* and *d* are more convergent after refraction than the rays which come through *a* and *b*. The analogies, therefore, which ascertain the foci of rays lying in planes passing through the axis do not determine the foci of the others. Of this we may be sensible by looking through a lens to a figure on which are drawn concentric circles crossed by radii. When the telescope is so adjusted that we see distinctly the extremity of one of the radii, we shall not see distinctly the circumference which crosses the extremity with equal distinctness, and *vice versa*. This difference, however, between the foci of the rays which come through *a* and *b*, and those which come through *c* and *d*, is not considerable in the fields of vision, which are otherwise admissible. But the same difference of foci obtains also with respect to the dispersion of light, and is more remarkable. Both d'Alembert and Euler have attempted to introduce it into their formulæ Fig. 17.

Telescope. mulæ; but they have made them useless for any practical purpose by their inextricable complication.

This must serve as a general indication of the difficulties which occur in the construction of telescopes, even although the object-glass were perfect, forming an image without the smallest confusion or distortion.

There is yet another difficulty or imperfection. The rays of the pencil *a* G *b*, when refracted through the eye-glass, are also separated into their component colours. The edge of the lens must evidently perform the office of a prism, and the white ray G *b* will be so dispersed that if *b i* be the path of its red ray, the violet ray, which makes another part of it, will take such a course *b n* that the angle *i' b n* will be nearly $\frac{1}{27}$th of G' *b i'*. The ray G *a* passing through a part of the lens whose surfaces are less inclined to each other, will be less refracted, and will be less dispersed in the same proportion very nearly. Therefore the two violet rays will be very nearly parallel when the two red rays are rendered parallel.

Hence it must happen, that the object will appear bordered with coloured fringes. A black line seen near the margin on a white ground, will have a ruddy and orange border on the outside and a blue border within: and this confusion is altogether independent on the object-glass, and is so much the greater as the visual angle *b* IE is greater.

Such are the difficulties: They would be unsurmountable were it not that some of them are so connected that, to a certain extent, the diminution of one is accompanied by a diminution of the other. What are called the *caustic curves* are the geometrical loci of the foci of infinitely slender pencils. Consequently the point G is very nearly in the caustic formed by a beam of light consisting of rays parallel to I *o*, and occupying the whole surface of the eye-glass, because the pencil of rays which are collected at G is very small. Any thing therefore that diminishes the mutual inclination of the adjoining rays, puts their concourse farther off. Now this is precisely what we want: for the point G of the image formed by the object-glass is already beyond the focus of the oblique slender pencil of parallel rays *i a* and *i' b*; and therefore, if we could make this focus go a little farther from *a* and *b*, we shall bring it nearer to G, and obtain more distinct vision of this point of the object. Now let it be recollected, that in moderate refractions through prisms, two rays which are inclined to each other in a small angle are, after refraction, inclined to each other in the same angle. Therefore, if we can diminish the aberration of the ray *a i*, or *o* I, or *bi'*, we diminish their mutual inclination; and consequently the mutual inclination of the rays G*a*, G *o*, G*b'*, and therefore lengthen the focus, and get more distinct vision of the point G. Therefore we at once correct the distortion and the indistinctness: and this is the aim of Mr Huyghens's great principle of dividing the refractions.

The general method is as follows: Let *o* be the object-glass (fig. 19.) and E the eye-glass of a telescope, and F their common focus, and FG the image formed by the object-glass. The proportion of their focal distances is supposed to be such as gives as great a magnifying power as the perfection of the object-glass will admit. Let BI be the axis of the emergent pencil. It is known by the focal theorem that GE is parallel to BI: therefore BGE is the whole refraction or deflection of the ray OHB from its former direction. Let it be proposed to diminish the aberrations by dividing this into two parts by means of two glasses D and *e*, so as to make the ultimate angle of vision *b i e* equal to BIE, and thus retain the same magnifying power and visible field. Let it be proposed to divide it into the parts BGC and CGE.

Fig. 19.

From G draw any line GD to the axis towards O; and draw the perpendicular DH, cutting OG in H; draw H *c* parallel to GC, cutting GD in *g*; draw *g f* perpendicular to the axis, and *g e* parallel to GE; draw *e b* perpendicular to the axis; draw D δ parallel to GC, and δ *d* perpendicular to the axis.

Then if there be placed at D a lens whose focal distance is D *d*, and another at *e* whose focal distance is *e f*, the thing is done. The ray OH will be refracted into H *b*, and this into *b i* parallel to BI.

The demonstration of this construction is so evident by means of the common focal theorem, that we need not repeat it, nor the reasons for its advantages. We have the same magnifying power, and the same field of vision; we have less aberration, and therefore less distortion and indistinctness; and this is brought about by a lens HD of a smaller aperture and a greater focal distance than BE. Consequently, if we are contented with the distinctness of the margin of the field with a single eye-glass, we may greatly increase the field of vision; for if we increase DH to the size of EB we shall have a greater field, and much greater distinctness in the margin; because HD is of a longer focal distance, and will bear a greater aperture, preserving the same distinctness at the edge. On this account the glass HD is commonly called the *Field-glass*.

It must be observed here, however, that although the distortion of the object is lessened, there is a real distortion produced in the image *f g*. But this, when magnified by the glass *e*, is smaller than the distortion produced by the glass E, of greater aperture and shorter focus, on the undistorted image GF. But because there is a distortion in the second image *f g*, this construction cannot be used for the telescopes of astronomical quadrants, and other graduated instruments; because then equal divisions of the micrometer would not correspond to equal angles.

But the same construction will answer in this case, by taking the point D on that side of F which is remote from O (fig. 20.). This is the form now employed in the telescopes of all graduated instruments. Fig. 20.

The exact proportion in which the distortion and the indistinctness at the edges of the field are diminished by this construction, depends on the proportion in which the angle BGE is divided by GC; and is of pretty difficult investigation. But it never deviates far (never $\frac{1}{8}$th in optical instruments) from the proportion of the squares of the angles. We may, without any sensible error, suppose it in this proportion. This gives us a practical rule of easy recollection, and of most extensive use. When we would diminish an aberration by dividing the whole refraction into two parts, we shall do it most effectually by making them equal. In like manner, if we divide it into three parts by means of two additional

Telescope. ditional glasses, we must make each $= \frac{1}{3}$d of the whole; and so on for a greater number.

This useful problem, even when limited, as we have done, to equal refractions, is as yet indeterminate; that is, susceptible of an infinity of solutions: for the point D, where the field-glass is placed, was taken at pleasure: yet there must be situations more proper than others. The aberrations which produce distortion, and those which produce indistinctness, do not follow the same proportions. To correct the indistinctness, we should not select such positions of the lens HD as will give a small focal distance to $b\,e$; that is, we should not remove it very far from F. Huygens recommends the proportion of 3 to 1 for that of the focal distances of the lens HD and $e\,b$, and says that the distance D e should be $= 2$ F e. This will make $e\,i = \frac{1}{2}\,e$ F, and will divide the whole refraction into two equal parts, as any one will readily see by constructing the common optical figure. Mr Short, the celebrated improver of reflecting telescopes, generally employed this proportion; and we shall presently see that it is a very good one.

It has been already observed that the great refractions which take place on the eye-glasses occasion very considerable dispersions, and disturb the vision by fringing every thing with colours. To remedy this, achromatic eye-glasses may be employed, constructed by the rules already delivered. This construction, however, is incomparably more intricate than that of object-glasses: for the equations must involve the distance of the radiant point, and be more complicated: and this complication is immensely increased on account of the great obliquity of the pencils.

Most fortunately the Huyghenian construction of an eye-piece enables us to correct this dispersion to a great degree of exactness. A heterogenous ray is dispersed at H, and the red ray belonging to it falls on the lens $b\,e$ at a greater distance from the centre than the violet ray coming from H. It will therefore be less refracted (*cæteris paribus*) by the lens $b\,e$; and it is possible that the difference may be such that the red and violet rays dispersed at H may be rendered parallel at b, or even a little divergent, so as to unite accurately with the red ray at the bottom of the eye. How this may be affected, by a proper selection of the places and figures of the lenses, will appear by the following proposition, which we imagine is new, and not inelegant.

Fig. 21. Let the compound ray OP (fig. 21.) be dispersed by the lens PC; and let PV, PR be its violet and red rays, cutting the axis in G and g. It is required to place another lens RD in their way, so that the emergent rays R r, V v, shall be parallel.

Produce the incident ray OP to Z. The angles ZPR, ZPV, are given, (and RPV is nearly $= \frac{\text{ZPR}}{27}$) and the intersections G and g with the axis. Let F be the focus of parallel red light coming through the lens RD in the opposite direction. Then (by the common optical theorem), the perpendicular F ϱ will cut PR in such a point ϱ, that ϱ F will be parallel to the emergent ray R r, and to V v. Therefore if ϱD cut PV in u, and $u\,f$ be drawn perpendicular to the axis, we shall have (also by the common theorem) the point f for the focus of violet rays, and DF : D f = Dϱ : Du = 28 : 27 nearly, or in a given ratio. Telescope.

The problem is therefore reduced to this, "To draw from a point D in the line CG a line Dϱ, which shall be cut by the lines PR and PV in the given ratio."

The following construction naturally offers itself: Make GM : gM in the given ratio, and draw MK parallel to Pg. Through *any* point D of CG draw the straight line PDK, cutting MK in K. Join GK, and draw Dϱ parallel to KG. This will solve the problem; and, drawing ϱ F perpendicular to the axis, we shall have F for the focus of the lens RD for parallel red rays.

The demonstration is evident: for MK being parallel to Pg, we have GM : gM = GK : HK, = ϱD : uD = FD fD, in the ratio required.

This problem admits of an infinity of solutions; because the point D may be taken anywhere in the line CG. It may therefore be subjected to such conditions as may produce other advantages.

1. It may be restricted by the magnifying power, or by the division which we choose to make of the whole refraction which produces this magnifying power. Thus, if we have resolved to diminish the aberrations by making the two refractions equal, we have determined the angle R r D. Therefore draw GK, making the angle MGK equal to that which the emergent pencil must make with the axis, in order to produce this magnifying power. Then draw MK parallel to Pg, meeting GK in K. Then draw PK, cutting the axis in D, and Dϱ parallel to GK, and ϱ F perpendicular to the axis. D is the place, and DF the focal distance of the eye-glass.

2. Particular circumstances may cause us to fix on a particular place D, and we only want the focal distance. In this case the first construction suffices.

3. We may have determined on a certain focal distance DF, and the place must be determined. In this case let

$$\text{GF} : \text{F}\varrho = 1 : \tan.\,\text{G}$$
$$\text{F}\varrho : fu = 1 : m,\ \text{m being} = \tfrac{27}{28}$$
$$fu : fg = \tan.\,g : 1$$

then $\text{GF} : fg = \tan.\,g : m \tan.\,\text{G}$

then $\text{GF}-fg : \text{GF} = \tan.\,g - m \tan.\,\text{G} : \tan.\,g$

or $\text{G}g + \text{F}f : \text{GF} = \tan.\,g - m \tan.\,\text{G} : \tan.\,g$;

and $\text{GF} = \text{G}g + \text{F}f \dfrac{\tan.\,g}{\tan.\,g - m \tan.\,\text{G}}$, and is therefore given, and the place of F is determined; and since FD is given by supposition, D is determined.

The application of this problem to our purpose is difficult, if we take it in the most general terms; but the nature of the thing makes such limitations that it becomes very easy. In the case of the dispersion of light, the angle G Pg is so small that MK may be drawn parallel to PG without any sensible error. If the ray OP were parallel to CG, then G would be the focus of the lens PC, and the point M would fall on C; because the focal distance of red rays is to that of violet rays in the same proportion for every lens, and therefore CG : Cg = DF : Df. Now, in a telescope which magnifies considerably, the angle at the object-glass is very small, and CG hardly exceeds the focal distance; and CG is to Cg very nearly in the same proportion of 28 to 27. We may therefore draw through C (fig. 22.) a line CK parallel Fig. 22.

Telescope. parallel to PG; then draw GK′ perpendicular to the axis of the lenses, and join PK′; draw K′BE parallel to CG, cutting PK in B; draw BHI parallel to GK, cutting GK′ in H: Join HD and PK. It is evident that CG is bisected in F′, and that K′B=2 F′D: also K′H : HG=K′B : BE, =CD : DG. Therefore DH is parallel to CK′, or to PG. But because PF′=F′K′, PD is = DB, and IH=HB. Therefore ½D=HB, and FD=K′B, =2 F′D; and FD is bisected in F′. Therefore $CD=\frac{CG+FD}{2}$.

That is, in order that the eye-glass RD may correct the dispersion of the field-glass PC, *the distance between them must be equal to the half sum of their focal distances* very nearly. More exactly, *the distance between them must be equal to the half sum of the focal distance of the eye-glass, and the distance at which the field-glass would form an image of the object-glass.* For the point G is the focus to which a ray coming from the centre of the object-glass is refracted by the field-glass.

This is a very simple solution of this important problem. Huyghens's eye-piece corresponds with it exactly. If indeed the dispersion at P is not entirely produced by the refraction, but perhaps combined with
Fig. 21. some previous dispersion, the point M (fig. 21.) will not
Fig. 22. coincide with C, (fig. 22.), and we shall have GC to GM, as the natural dispersion at P to the dispersion which really obtains there. This may destroy the equation $CD=\frac{CG+FD}{2}$.

Thus, in a manner rather unexpected, have we freed the eye-glasses from the greatest part of the effect of dispersion. We may do it entirely by pushing the eye-glass a little nearer to the field-glass. This will render the violet rays a little divergent from the red, so as to produce a perfect picture at the bottom of the eye. But by doing so we have hurt the distinctness of the whole picture, because F is not in the focus of RD. We remedy this by drawing both glasses out a little, and the telescope is made perfect.

This improvement cannot be applied to the con-
Fig. 20. struction of quadrant telescopes, such as fig. 20. Mr Ramsden has attempted it, however, in a very ingenious way, which merits a place here, and is also instructive in another way. The field-glass HD is a plano-convex, with its plane side next the image GF. It is placed very near this image. The consequence of this disposition is, that the image GF produces a vertical image *gf*, which is much less convex towards the glass. He then places a lens on the point C, where the red ray would cross the axis. The violet ray will pass on the other side of it. If the focal distance of this glass be *fc*, the vision will be distinct and free from colour. It has, however, the inconveniency of obliging the eye to be close to the glass, which is very troublesome.

This would be a good construction for a magic-lanthorn, or for the object-glass of a solar microscope, or indeed of any compound microscope.

We may presume that the reader is now pretty familiar with the different circumstances which must be considered in the construction of an eye-piece, and proceed to consider those which must be employed to erect the Telescope. object.

This may be done by placing the lens which receives the light from the object-glass in such a manner, that a second image (inverted with respect to the first) may be formed beyond it, and this may be viewed by an eye- Plate
glass. Such a construction is represented in fig. 23. DXXX.
But, besides many other defects, it tinges the object pro- Fig. 23.
digiously with colour. The ray *o d* is dispersed at *d* into the red ray *d r*, and the violet *d v*, *v* being farther from the centre than *r*, the refracted ray *v v′* crosses *r r′* both by reason of spherical aberration and its greater refrangibility.

But the common day telescope, invented by F. Rheita, has, in this respect, greatly the advantage of the one now described. The rays of compound light are dispersed at two points. The violet ray in its course falls without the red ray, but is accurately collected with it at a common focus, as we shall demonstrate by and by. Since they cross each other in the focus, the violet ray must fall within the red ray, and be less refracted than if it had fallen on the same point with the red ray. Had it fallen there it would have separated from it; but by a proper diminution of its refraction, it is kept parallel to it, or nearly so. And this is one excellence of this telescope: when constructed with three eye-glasses perfectly equal, the colour is sensibly diminished, and by using an eye-glass somewhat smaller, it may be removed entirely.—We say no more of it at present, because we shall find its construction included in another, which is still more perfect.

It is evident at first sight that this telescope may be improved, by substituting for the eye-glass the Huyghenian double eye-glass, or field-glass and eye-glass represented in fig. 19. and 20.; and that the first of these may be improved and rendered achromatic. This will require the two glasses *e f* and *g h* to be increased from their present dimensions to the size of a field-glass, suited to the magnifying power of the telescope, supposing it an astronomical telescope. Thus we shall have a telescope of four eye-glasses. The three first will be of a considerable focal distance, and two of them will have a common focus at *b*. But this is considerably different from the eye-piece of four glasses which are now used, and are far better. We are indebted for them to Mr Dollond, who was a mathematician as well as an artist, and in the course of his research discovered resources which had not been thought of. He had not then discovered the achromatic object-glass, and was busy in improving the eye-glasses by diminishing their spherical aberration. His first thought was to make the Huyghenian addition at both the images of the day telescope. This suggested to him the following eye-piece of five glasses.

Fig. 24. represents this eye-piece, but there is not Fig. 24.
room for the object-glass at its proper distance. A pencil of rays coming from the upper point of the object is made to converge (by the object-glass) to G, where it would form a picture of that part of the object. But it is intercepted by the lens A *a*, and its axis is bent towards the axis of the telescope in the direction *a b*. At the same time, the rays which converged to G converge to *g*, and there is formed an inverted picture of the object at *g f*. The axis of the pencil is again refracted at *b*,

Telescope. b, crosses the axis of the telescope in H, is refracted again at c, at d, and at e, and at last crosses the axis in I. The rays of this pencil, diverging from g, are made less diverging, and proceed as if they came from g', in the line B g g'. The lens c C causes them to converge to g', in the line G″ C g'. The lens d D makes them converge still more to G″, and there they form an erect picture G″ F″; diverging from G″, they are rendered parallel by the refraction at e.

At H the rays are nearly parallel. Had the glass B b been a little farther from A, they would have been accurately so, and the object-glass, with the glasses A and B, would have formed an astronomical telescope with the Huyghenian eye-piece. The glasses C, D, and E, are intended merely for bending the rays back again till they again cross the axis in I. The glass C tends chiefly to diminish the great angle BH b; and then the two glasses D and E are another Huyghenian eye-piece.

The art in this construction lies in the proper adjustment of the glasses, so as to divide the whole bending of the pencil pretty equally among them, and to form the last image in the focus of the eye-glass, and at a proper distance from the other glass. Bringing B nearer to A would bend the pencil more to the axis. Placing C farther from B would do the same thing; but this would be accompanied with more aberration, because the rays would fall at a greater distance from the centres of the lenses. The greatest bending is made at the field-glass D; and we imagine that the telescope would be improved, and made more distinct at the edges of the field, by employing another glass of great focal distance between C and D.

There is an image formed at H of the object-glasses, and the whole light passes through a small circle in this place. It is usual to put a plate here pierced with a hole which has the diameter of this image. A second image of the object-glass is formed at I, and indeed wherever the pencils cross the axis. A lens placed at H makes no change in any of the angles, nor in the magnifying power, and affects only the place where the images are formed. And, on the other hand, a lens placed at f, or F″, where a real image is formed, makes no change in the places of the images, but affects the mutual inclination of the pencils. This affords a resource to the artist, by which he may combine properties which seem incompatible.

The aperture of A determines the visible field and all the other apertures.

We must avoid forming a real image, such as fg, or F″ G″, on or very near any glass. For we cannot see this image without seeing along with it every particle of dust and every scratch on the glass. We see them as making part of the object when the image is exactly on the glass, and we see them confusedly, and so as to confuse the object, when the image is near it. For when the image is on or very near any glass, the pencil of light occupies a very small part of its surface, and a particle of dust intercepts a great proportion of it.

It is plain that this construction will not do for the telescope of graduated instruments, because the micrometer cannot be applied to the second image fg, on account of its being a little distorted, as has been observed of the Huyghenian eye-piece.

Also the interposition of the glass C makes it difficult to correct the dispersion. Telescope.

By proper reasoning from the correction in the Huyghenian eye-piece, we are led to the best construction of one with three glasses; which we shall now consider, taking it in a particular form, which shall make the discussion easy, and make us fully masters of the principles which lead to a better form. Therefore let PA (fig. 25.) be the glass which first receives the light proceeding from the image formed by the object-glass, and let OP be the axis of the extreme pencil. This is refracted into PR, which is again refracted into R r by the next lens B r. Let b be the focus of parallel rays of the second lens. Draw PB r. We know that A b : b B = PB : B r, and that rays of one kind diverging from P will be collected at r. But if PR, PV be a red and a violet ray, the violet ray will be more refracted at V, and will cross the red ray in some intermediate point g of the line R r. If therefore the first image had been formed precisely on the lens PA, we should have a second image at fg free from all coloured fringes. Fig. 25.

If the refractions at P and R are equal (as in the common day telescope), the dispersion at V must be equal to that at P, or the angle v V r = VPR. But we have ultimately RPV : R r V = BC : AB, (= B b : A b by the focal theorem). Therefore g V r : g r V, (or g r : g V, or C f : f B) = B b : A b, and AB : A b = R r : R g.

This shows by the way the advantage of the common day telescope. In this AB = 2 A b, and therefore f is the place of the last image which is free from coloured fringes. But this image will not be seen free from coloured fringes through the eye-glass C r, if f be its focus: For had g r, g v been both red rays, they would have been parallel after refraction; but g v being a violet ray, will be more refracted. It will not indeed be so much deflected from parallelism as the violet ray, which naturally accompanies the red ray to r, because it falls nearer the centre. By computation its dispersion is diminished about $\frac{1}{7}$th.

In order that g v may be made parallel to g r after refraction, the refraction at r must be such that the dispersion corresponding to it may be of a proper magnitude. How to determine this is the question. Let the dispersion at g be to the dispersion produced by the refraction at r (which is required for producing the intended magnifying power) as 1 to 9. Make 9 : 1 = ff' : f' C, = fC : CD, and draw the perpendicular D r' meeting the refracted ray r r' in r'. Then we know by the common focal theorem, that if f' be the focus of the lens C r, red rays diverging from g will be united in r'. But the violet ray g v will be refracted into v v' parallel to r r'. For the angle v r' r : v g r = (ultimately) fC : CD, = 9 : 1. Therefore the angle v r' r is equal to the dispersion produced at r, and therefore equal to r' v v', and v v' is parallel to r r'.

But by this we have destroyed the distinct vision of the image formed at fg, because it is no longer at the focus of the eye-glass. But distinct vision will be restored by pushing the glasses nearer to the object-glass. This makes the rays of each particular pencil more divergent after refraction through A, but scarcely makes any change in the directions of the pencils themselves. Thus the image comes to the focus f', and makes no sensible change in the dispersions.

In

Telescope.

In the common day telescope, the first image is formed in the anterior focus of the first eye-glass, and the second image is at the anterior focus of the last eye-glass. If we change this last for one of half the focal distance, and push in the eye-piece till the image formed by the object-glass is half way between the first eye-glass and its focus, the last image will be formed at the focus of the new eye-glass, and the eye-piece will be achromatic. This is easily seen by making the usual computations by the focal theorem. But the visible field is diminished, because we cannot give the same aperture as before to the new eye-glass; but we can substitute for it two eye glasses like the former, placed close together. This will have the same focal distance with the new one, and will allow the same aperture that we had before.

On these principles may be demonstrated the correction of colour in eye pieces with three glasses of the following construction.

Let the glasses A and B be placed so that the posterior focus of the first nearly coincides with the anterior focus of the second, or rather so that the anterior focus of B may be at the place where the image of the object-glass is formed, by which situation the aperture necessary for transmitting the whole light will be the smallest possible. Place the third C at a distance from the second, which exceeds the sum of their focal distances by a space which is a third proportional to the distance of the first and second, and the focal distance of the second. The distance of the first eye-glass from the object-glass must be equal to the product of the focal distance of the first and second divided by their sum.

Let O o, A a, B b, C c, the focal distances of the glasses, be O, a, b, c. Then make $AB = a+b$ nearly; $BC = b+c+\frac{b^2}{b+c}$; $OA = \frac{bc}{b+c}$. The amplification or magnifying power will be $= \frac{ob}{ac}$; the equivalent eye-glass $= \frac{ac}{b}$; and the field of vision $= 3438' \times \frac{\text{Aperture of A}}{\text{foc. dist. ob. gl.}}$.

These eye-pieces will admit the use of a micrometer at the place of the first image, because it has no distortion.

Mr Dollond was anxious to combine this achromatism of the eye-pieces with the advantages which he had found in the eye-pieces with five glasses. This eye piece of three glasses necessarily has a very great refraction at the glass B, where the pencil which has come from the other side of the axis must be rendered again convergent, or at least parallel to it. This occasions considerable aberrations. This may be avoided by giving part of this refraction to a glass put between the first and second, in the same way as he has done by the glass B put between A and C in his five glass eye-piece. But this deranges the whole process. His ingenuity, however, surmounted this difficulty, and he made eye-pieces of four glasses, which seem as perfect as can be desired. He has not published his ingenious investigation; and we observe the London artists work very much at random, probably copying the proportions of some of his best glasses, without understanding the principle, and therefore frequently mistaking. We see many eye-pieces which are far from being achromatic. We imagine therefore that it will be an acceptable thing to the artists to have precise instructions how to proceed, nothing of this kind having appeared in our language, and the investigations of Euler, d'Alembert, and even Boscovich, being so abstruse as to be inaccessible to all but experienced analysts. We hope to render it extremely simple.

It is evident, that if we make the rays of different colours unite on the surface of the last eye-glass but one, commonly called the *field-glass*, the thing will be done, because the dispersion from this point of union will then unite with the dispersion produced by this glass alone; and this increased dispersion may be corrected by the last eye-glass in the way already shown.

Therefore let A, B (fig. 26.) be the stations which we have fixed on for the first and second eye-glasses, in order to give a proper portion of the whole refraction to the second glass. Let b be the anterior focus of B. Draw PB r through the centre of B. Make $Ab : bB = AB : BK$. Draw the perpendicular K r, meeting the refracted ray in r. We know by the focal theorem, that red rays diverging from P will converge to r; but the violet ray PV, being more refracted, will cross R r in some point g. Drawing the perpendicular fg, we get f for the proper place of the field-glass. Let the refracted ray R r, produced backward, meet the ray OP coming from the centre of the object-glass in O. Let the angle of dispersion RPV be called p, and the angle of dispersion at V, that is, r V v, be v, and the angle V r R be r. Fig. 26.

It is evident that $OR : OP = p : v$, because the dispersions are proportional to the sines of the refractions, which, in this case, are very nearly as the refractions themselves.

Let $\frac{OP}{OR}\left(\text{or } \frac{op}{pB} \text{ or } \frac{pB}{bB}\right)$ be made $= m$. Then $v = mp$; also $p : r = BK : AB, = bB : Ab$, and $r = p.\frac{Ab}{bB}$, or making $\frac{Ab}{Bb} = n, r = np$; therefore $v : r = m : n, = \frac{pB}{bB} : \frac{Ab}{bB}, = pB : Ab$.

The angle $RgV = gVr + grV = p.\overline{m+n}$; and $RgV : RrV = Rr : Rg$, or $m+n : n = Rr : Rg$, and $Rg = Rr\frac{n}{m+n}$. But R r is ultimately $= BK = AB\frac{bB}{Ab} = \frac{AB}{n}$. Therefore $Rg = \frac{AB}{n} \times \frac{n}{m+n} = \frac{n}{m+n}$, and $Bf = \frac{AB}{m+n}$.

This value of Bf is evidently $= bB \times \frac{AB}{pB+Ab}$. Now bB being a constant quantity while the glass B is the same, the place of union varies with $\frac{AB}{pB+Ab}$. If we remove B a little farther from A, we increase AB, and pB, and Ab, each by the same quantity. This evidently diminishes Bf. On the other hand, bringing B nearer to A increases Bf. If we keep the distance between the glasses the same, but increase the focal distance bB, we augment Bf, because this change aug-

Telescope. ments the numerator and diminishes the denominator of the fraction $\frac{bB \times AB}{pB + Ab}$.

In this manner we can unite the colours at what distance we please, and consequently can unite them in the place of the intended field-glass, from which they will diverge with an increased dispersion, viz. with the dispersion competent to the refraction produced there, and the dispersion $p \times \overline{m+n}$ conjoined.

It only remains to determine the proper focal distances of the field-glass and eye-glass, and the place of the eye-glass, so that this dispersion may be finally corrected.

This is an indeterminate problem, admitting of an infinity of solutions. We shall limit it by an equal division of the two remaining refractions, which are necessary in order to produce the intended magnifying power. This construction has the advantage of diminishing the aberration. Thus we know the two refractions, and the dispersion competent to each; it being nearly $\frac{1}{27}$th of the refraction. Call this q. The whole dispersion at the field-glass consists of q, and of the angle KgV of fig. 19. which we also know to be $= p \times \overline{m+n}$. Call their sum s.

Fig. 27. Let fig. 27. represent this addition to the eye-piece. Cg is the field-glass coming in the place of fg of fig. 26. and Rgw is the red ray coming from the glass BR. Draw gs parallel to the intended emergent pencil from the eye-glass; that is, making the angle Csg with the axis correspond to the intended magnifying power. Bisect this angle by the line gK. Make $sg : gq = s : q$, and draw qK, cutting Cg in t. Draw $t\delta$D, cutting gk in δ, and the axis in D. Draw δd and Dr perpendicular to the axis. Then a lens placed in D, having the focal distance Dd, will destroy the dispersion at the lens gc, which refracts the ray gw into gr.

Let gv be the violet ray, making the angle $vgr = s$. It is plain, by the common optical theorem, that gr will be refracted into rr' parallel to δD. Draw gDr' meeting rr', and join vr'. By the focal theorem two red rays $grgv$, will be united in r'. But the violet ray gv will be more refracted, and will take the path vv', making the angle of dispersion $r'vv' = q$, very nearly, because the dispersion at v does not sensibly differ from that at r. Now, in the small angles of refraction which obtain in optical instruments, the angles $rr'v$, rgv are very nearly as gr and rr', or as gD and Dr', or as CD and DT; which, by the focal theorem, are as Cd and dD; that is, D$d : dc = rgv : rr'v$. But D$d : d$C $=$ D$\delta : \delta t$, $= sg : gq$, $= s : q$. But $rgv = s$; therefore $rr'v = q$, $= r'vv'$, and vv' is parallel to rr', and the whole dispersion at g is corrected by the lens Dr. The focal distance Cc of Cg is had by drawing C$\varkappa$ parallel to Kg, meeting Rg in $\varkappa$, and drawing $\varkappa c$ perpendicular to the axis.

It is easy to see that this (not inelegant) construction is not limited to the equality of the refractions wgr, Krr'. In whatever proportion the whole refraction wgs is divided, we always can tell the proportion of the dispersions which the two refractions occasion at g and r, and can therefore find the values of s and q. Indeed this solution includes the problem in p. 266. col. 2. par. ult.; but it had not occurred to us till the present occasion. Our readers will not be displeased with this variety of resource. Telescope.

The intelligent reader will see, that in this solution some quantities and ratios are assumed as equal which are not strictly so, in the same manner as in all the elementary optical theorems. The parallelism, however, of vv' and rr' may be made accurate, by pushing the lens Dr nearer to Cg, or retiring it from it. We may also, by pushing it still nearer, induce a small divergency of the violet ray, so as to produce accurate vision in the eye, and may thus make the vision through a telescope more perfect than with the naked eye, where dispersion is by no means avoided. It would therefore be an improvement to have the eye-glass in a sliding tube for adjustment. Bring the telescope to distinct vision; and if any colour be visible about the edges of the field, shift the eye glass till this colour is removed. The vision may now become indistinct: but this is corrected by shifting the place of the whole eye-piece.

We have examined trigonometrically the progress of a red and a violet ray through many eye-pieces of Dollond's and Ramsden's best telescopes; and we have found in all of them that the colours are united on or very near the field-glass; so that we presume that a theory somewhat analogous to ours has directed the ingenious inventors. We meet with many made by other artists, and even some of theirs, where a considerable degree of colour remains, sometimes in the natural order and often in the contrary order. This must happen in the hands of mere imitators, ignorant of principle. We presume that we have now made this principle sufficiently plain.

Fig. 28. represents the eye-piece of a very fine spy-glass by Mr Ramsden; the focal length of its object-glass is $8\frac{1}{2}$ inches, with $1\frac{1}{10}$th of aperture, $2^\circ\ 05'$ of visible field, and 15.4 magnifying power. The distances and focal lengths are of their proper dimensions, but the apertures are $\frac{1}{6}$ larger, that the progress of a lateral pencil might be more distinctly drawn. The dimensions are as follow: Fig. 28.

Foc. lengths Aa=0.775 Bb=1.025 Cc=1.01 Dd=0.79
Distances AB=1.18 BC=1.83 CD=1.105.

It is perfectly achromatic, and the colours are united, not precisely at the lens Cg, but about $\frac{1}{20}$th of an inch nearer the eye-glass.

It is obvious that this combination of glasses may be used as a microscope; for if, instead of the image formed by the object-glass at FG, we substitute a small object, illuminated from behind, as in compound microscopes; and if we draw the eye-piece a very small way from this object, the pencils of parallel rays emergent from the eye-glass D will become convergent to very distant points, and will there form an inverted and enlarged picture of the object, which may be viewed by a Huyghenian eye-piece; and we may thus get high magnifying powers without using very deep glasses. We tried the eye-piece of which we have given the dimensions in this way, and found that it might be made to magnify 180 times with very great distinctness. When used as the magnifier of a solar microscope, it infinitely surpasses every thing we have ever seen. The picture formed by a solar microscope is generally so indistinct, that it is fit only for amusing ladies; but with this magnifier it seemed

Telescope. ed perfectly sharp. We therefore recommend this to the artists as a valuable article of their trade.

The only thing which remains to be considered in the theory of refracting telescopes is the forms of the different lenses. Hitherto we have had no occasion to consider any thing but their focal distances; but their aberrations depend greatly on the adjustment of their forms to their situations. When the conjugate focuses of a lens are determined by the service which it is to perform, there is a certain form or proportion between the curvatures of their anterior and posterior surfaces, which will make their aberrations the smallest possible.

It is evident that this proportion is to be obtained by making the fluxion of the quantity within the parenthesis in the formula at the top of col. 2. p. 248. equal to nothing. When this is done, we obtain this formula for a, the radius of curvature for the anterior surface of a lens. $\frac{1}{a}=\frac{2m^2+m}{2m+4}+\frac{4m+4}{2(m+4)r}$, where m is the ratio of the sine of incidence to the sine of refraction, and r is the distance of the focus of incident rays, positive or negative, according as they converge or diverge, all measured on a scale of which the unit is n, = half of the radius of the equivalent iscoseles lens.

It will be sufficiently exact for our purpose to suppose $m=\frac{3}{2}$, though it is more nearly $\frac{31}{20}$. In this case $\frac{1}{a}=\frac{b}{7}+\frac{10}{7r}, =\frac{42r+70}{49r}$. Therefore $a=\frac{49r}{42r+70}$. And $\frac{1}{b}=\frac{1}{a}-1, =\frac{1-a}{a}$.

As an example, let it be required to give the radii of curvature in inches for the eye-glass be of page 262. col. 1. par. 4. which we shall suppose of $1\frac{1}{2}$ inches focal distance, and that ec ($=r$) is $3\frac{3}{4}$th inches.

The radius of curvature for the equivalent isosceles lens is 1.5, and its half is 0.75. Therefore $r=\frac{3\frac{3}{4}}{0.75}, =5$; and our formula is $a=\frac{49\times5}{42\times5+70}, =\frac{245}{280}, =0.875$; and $\frac{1}{b}=\frac{1-a}{a}, =\frac{0.125}{0.875}$, and $b=\frac{0.875}{0.125}, =7$.

These values are parts of a scale, of which the unit is 0.75 inches. Therefore

a, in inches, $=0.875\times0.75, =0.65525$
b, in inches, $=7\times0.75, \quad =5.25$.

And here we must observe that the posterior surface is concave: for b is a positive quantity, because $1-a$ is a positive quantity as well as a; therefore the centre of sphericity of both surfaces lies beyond the lens.

And this determination is not very different from the usual practice, which commonly makes this lens a plane convex with its flat side next the eye: and there will not be much difference in the performance of these two lenses; for in all cases of maxima and minima, even a pretty considerable change of the best dimensions does not make a sensible change in the result.

The same consideration leads to a rule which is very simple, and sufficiently exact for ordinary situations. Telescope. This is to make the curvatures such, that the incident and emergent pencils may be nearly equally inclined to the surfaces of the lens. Thus in the eye-piece with five glasses, A and B should be most convex on their anterior sides; C should be most convex on the posterior side; D should be nearly isosceles; and E nearly plano-convex.

But this is not so easy a matter as appears at first sight. The lenses of an eye-piece have not only to bend the several pencils of light to and from the axis of the telescope; they have also to form images on the axes of these pencils. These offices frequently require opposite forms, as mentioned in par. 3. col. 2. p. 261. Thus the glass A fig. 28. should be most convex on the side next the object, that it may produce little distortion of the pencils. But it should be most convex next the eye, that it may produce distinct vision of the image FG, which is very near it. This image should have its concavity turned towards A, whereas it is towards the object-glass. We must therefore endeavour to made the vertical image fg flatter, or even convex. This requires a glass very flat before and convex behind. For similar reasons the object-glass of a microscope and the simple eye-glass of an astronomical telescope should be formed the same way. Fig. 28.

This is a subject of most difficult discussion, and requires a theory which few of our readers would relish; nor does our limits afford room for it. The artists are obliged to grope their way. The proper method of experiment would be, to make eye-pieces of large dimensions, with extravagant apertures to increase the aberrations, and to provide for each station A, B, C, and D, a number of lenses of the same focal distance, but of different forms: and we would advise making the trial in the way of a solar microscope, and to have two eye-pieces on trial at once. Their pictures can be formed on the same screen, and accurately compared; whereas it is difficult to keep in remembrance the performance of one eye-piece, and compare it with another.

We have now treated the theory of refracting telescopes with considerable minuteness, and have perhaps exceeded the limits which some readers may think reasonable. But we have long regretted that there is not any theory on this subject from which a curious person can learn the improvements which have been made since the time of Dr Smith, or an artist learn how to proceed with intelligence in his profession. If we have accomplished either of these ends, we trust that the public will receive our labours with satisfaction.

We cannot add any thing to what Dr Smith has delivered on the theory of reflecting telescopes. There appears to be the same possibility of correcting the aberration of the great speculum by the contrary aberration of a convex small speculum, that we have practised in the compound object-glass of an achromatic refracting telescope. But this cannot be, unless we make the radius of the convex speculum exceedingly large, which destroys the magnifying power and the brightness. This therefore must be given up. Indeed their performance, when well executed, does already surpass all imagination. Dr Herschel has found great advantages in what he calls the *front view*, not using a plane mirror to throw the pencils to one side. But this cannot be

Telescope. be practised in any but telescopes so large, that the loss of light, occasioned by the interposition of the observer's head, may be disregarded.

NOTHING remains but to describe the mechanism of some of the most convenient forms.

To describe all the varieties of shape and accommodation which may be given to a telescope, would be a task as trifling as prolix. The artists of London and of Paris have racked their inventions to please every fancy, and to suit every purpose. We shall content ourselves with a few general maxims, deduced from the scientific consideration of a telescope, as an instrument by which the visual angle subtended by a distant object is greatly magnified.

The chief consideration is to have a steady view of the distant object. This is unattainable, unless the axis of the instrument be kept constantly directed to the same point of it: for when the telescope is gently shifted from its position, the object *seems to move* in the same or in the opposite direction, according as the telescope inverts the object or shows it erect. This is owing to the magnifying power, because the apparent angular motion is greater than what we naturally connect with the motion of the telescope. This does not happen when we look through a tube without glasses.

All shaking of the instrument therefore makes the object dance before the eye; and this is disagreeable, and hinders us from seeing it distinctly. But a tremulous motion, however small, is infinitely more prejudicial to the performance of a telescope, by making the object quiver before us. A person walking in the room prevents us from seeing distinctly; nay, the very pulsation in the body of the observer, agitates the floor enough to produce this effect, when the telescope has a great magnifying power: For the visible motion of the object is then an imperceptible tremor, like that of an harpsichord wire, which produces an effect precisely similar to optical indistinctness; and every point of the object is diffused over the whole space of the angular tremor, and appears coexistent in every part of this space, just as a harpsichord wire does while it is sounding. The more rapid this motion is, the indistinctness is the more complete. Therefore the more firm and elastic and well bound together the frame-work and apertures of our telescope is, the more hurtful will this consequence be. A mounting of lead, were it practicable, would be preferable to wood, iron, or brass. This is one great cause of the indistinctness of the very finest reflecting telescopes of the usual constructions, and can never be totally removed. In the Gregorian form, it is hardly possible to damp the elastic tremor of the small speculum, carried by an arm supported at one end only, even though the tube were motionless. We were witnesses of a great improvement made on a four-feet reflecting telescope, by supporting the small speculum by a strong plate of lead placed across the tube, and led by an adjusting screw at each end. But even the great mirror may vibrate enough to produce indistinctness. Refracting telescopes are free from this inconveniency, because a small angular motion of the object-glass round one of its own diameters has no sensible effect on the image in its focus. They are affected only by an angular motion of the axis of the telescope or of the eye-glasses.

This single consideration gives us great help towards judging of the merits of any particular apparatus. We should study it in this particular, and see whether its form makes the tube readily susceptible of such tremulous motions. If it does, the firmer it is and the more elastic it is, the worse. All forms therefore where the tube is supported only near the middle, or where the whole immediately or remotely depend on one narrow joint, are defective.

Reasoning in this way, we say with confidence, that of all the forms of a telescope apparatus, the old fashioned simple stand represented in fig. 29. is by far the best, and that others are superior according as the disposition of the points of support of the tube approaches to this. Let the pivots A, B, be fixed in the lintel and sole of a window. Let the four braces terminate very near to these pivots. Let the telescope lie on the pin F*f*, resting on the shoulder round the eye-piece, while the far end of it rests on one of the pins 1, 2, 3, &c.; and let the distance of these pins from F very little exceed the length of the telescope. The trembling of the axis, even when considerable, cannot affect the position of the tube, because the braces terminate almost at the pivots. The tremor of the brace CD does as little harm, because it is nearly perpendicular to the tube. And if the object glass were close at the upper supporting pin, and the focus at the lower pin F, even the bending and trembling of the tube will have no effect on its optical axis. The instrument is only subject to horizontal tremors. These may be almost annihilated by having a slender rod coming from a hook's joint in the side of the window, and passing through such another joint close by the pin F. We have seen an instrument of this form, having AB parallel to the earth's axis. The whole apparatus did not cost 50 shillings, and we find it not in the least sensible manner affected by a storm of wind. It was by observations with this instrument that the tables of the motions of the Georgium Sidus, published in the Edinburgh Transactions, were constructed, and they are as accurate as any that have yet appeared. This is an excellent equatorial. Fig. 29.

But this apparatus is not portable, and it is sadly deficient in elegance. The following is the best method we have seen of combining these circumstances with the indispensable requisites of a good telescope.

The pillar VX (fig. 30.) rises from a firm stand, and has a horizontal motion round a cone which completely fills it. This motion is regulated by a rack-work in the box at V. The screw of this rack-work is turned by means of the handle P, of a convenient length, and the screw may be disengaged by the click or detent V, when we would turn the instrument a great way at once. The telescope has a vertical motion round the joint Q placed near the middle of the tube. The lower end of the tube is supported by the stay OT. This consists of a tube RT, fastened to the pillar by a joint T, which allows the stay to move in a vertical plane. Within this tube slides another, with a stiff motion. This tube is connected with the telescope by another joint O, also admitting motion in a vertical plane. The side M of this inner tube is formed into a rack, in which works a pinion fixed to the top of the tube RT, and turned by the flat finger-piece R. The reader will readily see the advantages and the remaining defects of this apparatus. It is very portable, because the telescope is easily disengaged from it, and the legs and stay fold up. If the joint Fig. 30.

Telescope. joint Q were immediately under A, it would be much freer from all tremor in the vertical plane. But nothing can hinder other tremors arising from the long pillar and the three springy legs. These communicate all external agitations with great vigour. The instrument should be set on a stone pedestal, or, what is better, a cask filled with wet sand. This pedestal, which necessity perhaps suggested to our scientific navigators, is the best that can be imagined.

Fig. 31. Fig. 31. is the stand usually given to reflecting telescopes. The vertical tube FBG is fastened to the tube by finger screws, which pass through the slits at F and G. This arch turns round a joint in the head of the divided pillar, and has its edge cut into an oblique rack, which is acted on by the horizontal screw, furnished with the finger-piece A. This screw turns in a horizontal square frame. This frame turns round a horizontal joint in the off-side, which cannot be seen in this view. In the side of this frame next the eye there is a finger-screw *a*, which passes through the frame, and presses on the round horizontal plate D. By screwing down this finger-screw, the frame is brought up, and presses the horizontal screw to the rack. Thus the elevation of the telescope is fixed, and may be nicely changed by the finger applied to A and turning this screw. The horizontal round plate D moves stiffly round on another plate of nearly equal diameter. This under plate has a deep conical hollow socket, which is nicely fitted by grinding to a solid cone formed on the top of the great upright pillar, and they may be firmly fixed in any position by the finger-screw E. To the under plate is fastened a box *c*, containing a horizontal screw C, which always works in a rack cut in the edge of the upper plate, and cannot be disengaged from it. When a great vertical or horizontal motion is wanted, the screws *a* and E are slacked, and by tightening them the telescope may be fixed in any position, and then any small movements may be given it by the finger plates A and C.

This stand is very subject to brisk tremor, either from external agitation of the pedestal, or from the immediate action of the wind; and we have seldom seen distinctly through telescopes mounted in this manner, till one end of the tube was pressed against something that was very steady and unelastic. It is quite astonishing what a change this produces. We took a very fine telescope made by James Short, and laid the tube on a great lump of soft clay, pressing it firmly down into it. Several persons, ignorant of our purpose, looked through it, and read a table of logarithms at the distance of 310 yards. We then put the telescope on its stand, and pointed it at the same object; none of the company could read at a greater distance than 235 yards, although they could perceive no tremor. They thought the vision as sharp as before; but the incontrovertible proof of the contrary was, that they could not read at such a distance.

If the round plates were of much greater dimensions; and if the lower one, instead of being fixed to the pillar, were supported on four stout pillars standing on another plate; and if the vertical arch had a horizontal axis turning on two upright frames firmly fixed to the upper plate—the instrument would be much freer from tremor. Such stands were made formerly; but being much more bulky and inconvenient for package, they have gone into disuse. Telescope.

The high magnifying powers of Dr Herschel's telescopes made all the usual apparatus for their support extremely imperfect. But his judgement, and his ingenuity and fertility in resource, are as eminent as his philosophical ardour. He has contrived for his reflecting telescopes stands which have every property that can be desired. The tubes are all supported at the two ends. The motions, both vertical and horizontal, are contrived with the utmost simplicity and firmness. We cannot more properly conclude this article than with a description of his 40 feet telescope, the noblest monument of philosophical zeal and of princely munificence that the world can boast of.

Plate DXXXI. Fig. 32. Fig. 32. represents a view of this instrument in a meridional situation, as it appears when seen from a convenient distance by a person placed to the south-west of it. The foundation in the ground consists of two concentric circular brick walls, the outermost of which is 42 feet in diameter, and the inside one 21 feet. They are two feet six inches deep under ground; two feet three inches broad at the bottom, and one foot two inches at the top; and are capped with paving stones about three inches thick, and twelve and three quarters broad. The bottom frame of the whole apparatus rests upon these two walls by twenty concentric rollers III, and is moveable upon a pivot, which gives a horizontal motion to the whole apparatus, as well as to the telescope.

The tube of the telescope, A, though very simple in its form, which is cylindrical, was attended with great difficulties in the construction. This is not to be wondered at; when its size, and the materials of which it is made, are considered. Its length is 39 feet four inches; it measures four feet ten inches in diameter; and every part of it is of iron. Upon a moderate computation, the weight of a wooden tube must have exceeded an iron one at least 3000 pounds; and its durability would have been far inferior to that of iron. It is made of rolled or sheet iron, which has been joined together without rivets, by a kind of seaming well known to those who make iron funnels for stoves.

Very great mechanical skill is used in the contrivance of the apparatus by which the telescope is supported and directed. In order to command every altitude, the point of support is moveable; and its motion is effected by mechanism, so that the telescope may be moved from its most backward point of support to the most forward, and, by means of the pulleys GG suspended from the great beam H, be set to any altitude, up to the very zenith. The tube is also made to rest with the point of support in a pivot, which permits it to be turned sidewise.

The concave face of the great mirror is 48 inches of polished surface in diameter. The thickness, which is equal in every part of it, remains now about three inches and a half; and its weight, when it came from the cast was 2118 pounds, of which it must have lost a small quantity in polishing. To put this speculum into the tube, it is suspended vertically by a crane in the laboratory, and placed on a small narrow carriage, which is drawn out, rolling upon planks, till it comes near the back of the tube; here it is again suspended

ſuſpended and placed in the tube by a peculiar apparatus.

The method of obſerving by this teleſcope is by what Dr Herſchel calls the *front view;* the obſerver being placed in a ſeat C, ſuſpended at the end of it, with his back towards the object he views. There is no ſmall ſpeculum, but the magnifiers are applied immediately to the firſt local image.

From the opening of the teleſcope, near the place of the eye-glaſs, a ſpeaking pipe runs down to the bottom of the tube, where it goes into a turning joint; and after ſeveral other inflections, it at length divides into two branches, one going into the obſervatory D, and the other into the work-room E. By means of the ſpeaking pipe the communications of the obſerver are conveyed to the aſſiſtant in the obſervatory, and the workman is directed to perform the required motions.

In the obſervatory is placed a valuable ſidereal time-piece, made by Mr Shelton. Cloſe to it, and of the ſame height, is a polar diſtance-piece, which has a dial-plate of the ſame dimenſions with the time-piece: this piece may be made to ſhow polar diſtance, zenith diſtance, declination or altitude, by ſetting it differently. The time and polar diſtance pieces are placed ſo that the aſſiſtants ſit before them at a table, with the ſpeaking-pipe riſing between them; and in this manner obſervations may be written down very conveniently.

This noble inſtrument, with proper eye-glaſſes, magnifies above 6000 times, and is the largeſt that has ever been made. Such of our readers as wiſh for a fuller account of the machinery attached to it, viz. the ſtairs, ladders, and platform B, may have recourſe to the ſecond part of the Tranſactions of the Royal Society for 1795; in which, by means of 18 plates and 63 pages of letter-preſs, an ample detail is given of every circumſtance relating to joiner's work, carpenter's work, and ſmith's work, which attended the formation and erection of this teleſcope. It was completed on Auguſt the 28th 1789, and on the ſame day was the ſixth ſatellite of Saturn diſcovered.

TELL, William, an illuſtrious Swiſs patriot, chief inſtrument of the revolution which delivered the Swiſs cantons from the German yoke in 1307. Griſler, the governor of theſe provinces for the emperor Albert, having ordered him, under pain of death, to ſhoot at an apple placed on the head of one of his children; he had the dexterity, though the diſtance was very conſiderable, to ſtrike it off without hitting the child. The tyrant, perceiving he had another arrow concealed under his cloak, aſked him for what purpoſe? To which he boldly replied, "To have ſhot you through the heart, if I had had the misfortune to kill my ſon." The enraged governor now ordered him to be hanged; but his fellow-citizens, animated by his fortitude and patriotiſm, flew to arms; attacked and vanquiſhed Griſler, who was ſhot to death by Tell; and the aſſociation for the independency took place that inſtant.

Tell-Tale, a name ſometimes given to the *Perpetual-Log.* See that article.

TELLER, an officer of the exchequer, in ancient records called *tallier.* There are four of theſe officers, whoſe duty is to receive all ſums due to the king, and to give the clerk of the pells a bill to charge him therewith. They likewiſe pay all money due from the king, by warrant from the auditor of the receipt; and make weekly and yearly books both of their receipts and payments, which they deliver to the lord treaſurer.

TELLINA, a genus of ſhell-fiſh. See Conchology *Index.*

TEMISSA, a large town in Africa, about 120 miles north-eaſt of Mourzouk, the capital of Fezzan. Here the caravan of pilgrims from Bornou and Nigritia, which takes its departure from Mourzouk, and travels by the way of Cairo to Mecca, uſually provides the ſtores of corn and dates, and dried meat, that are requiſite for its dreary paſſage.

TEMPE, in *Ancient Geography*, a moſt pleaſant place or valley of Theſſaly. That it was there, appears from the epithets *Theſſalica* (Livy), *Theſſala* (Ovid); but in what particular diſtrict is the queſtion. From the Phthiotica of Catullus, it ſhould ſeem to be of Phthiotis: but the Peneus, which ran through Tempe, was at too great a diſtance, being ſeparated from it by Mount Othrys and others. Firſt, however, we ſhall define Tempe, previous to the determining the particular diſtrict in which it lay. The Peneus, according to Pliny, running down between Oſſa to the ſouth and Olympus to the north for 500 ſtadia, is for half that ſpace navigable: in the direction of this courſe lies what is called *Tempe*, extending in length for five miles, in breadth for about an acre and a half, with gentle convexities riſing on the right and left hand. Within glides the pure ſtream of the Peneus, charming in the graſs on its banks, and harmoniouſly vocal with the muſic of birds. In this deſcription Strabo and Ælian agree; the laſt adding, that it has an agreeable variety of places of retreat; and that it is not the work of man's hand, but the ſpontaneous production of nature; and Strabo ſays, that formerly the Peneus formed a lake in this ſpot, being checked in its courſe by the higher grounds about the ſea; but that an opening being made by an earthquake, and Mount Oſſa torn from Olympus, the Peneus gained a free courſe between them. But Livy, who calls Tempe a grove, remarks a degree of horror rather than amenity, with which the Roman army was ſtruck on marching over the narrow paſs; for, beſides the defile, difficult to go over, which runs on for five miles, there are ſteep rocks on each hand, down which the proſpect is apt to cauſe a dizzineſs, heightened by the noiſe and depth of the interfluent Peneus. Hence it appears that Tempe was in the Pelaſgiotis, whoſe extremity was formerly the Peneus, but afterwards, as is probable, allotted to Magneſia; and thus Pliny places the mouth of the Peneus not in Theſſaly itſelf, but in the Magneſia of Theſſaly.

TEMPER, in a mechanical ſenſe. See Tempering.

Temper, in a moral ſenſe, the diſpoſition of mind, whether natural or acquired. The word is ſeldom uſed by good writers without an epithet, as a *good* or *bad* temper; though one of the moſt beautiful poems in the language is entitled *The Triumphs of Temper.*

It is well obſerved by an elegant eſſayiſt, that more conſtant uneaſineſs ariſes from ill temper than from ill fortune; as a bad temper embitters every ſweet, and converts a paradiſe into a place of torment. For ſubduing the heart to ſoftneſs, and preſerving a due balance of the paſſions, a proper culture of the underſtanding and of the taſte is the beſt method. He who employs his

Fig. 7.

Fig. 6.

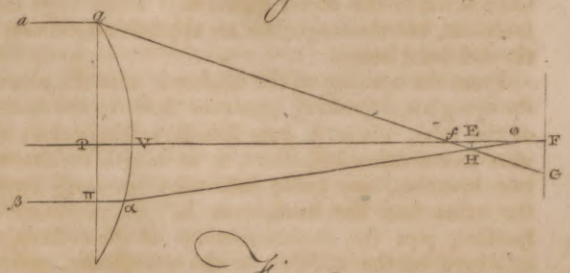


Fig. 8.

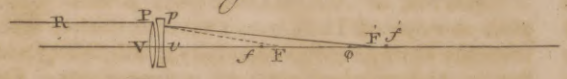


Fig. 10.

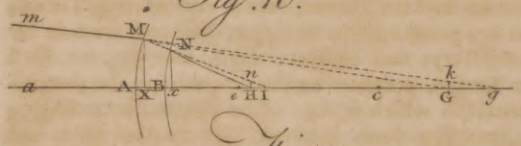


Fig. 9.

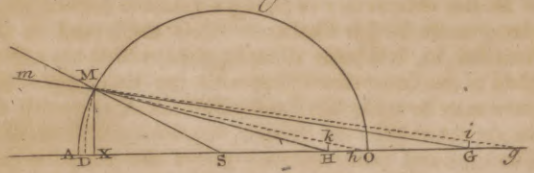


Fig. 11.

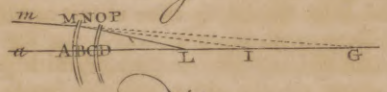


Fig. 12.

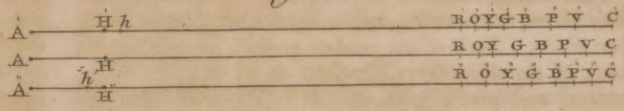


Fig. 15.

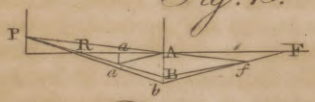


Fig. 14.

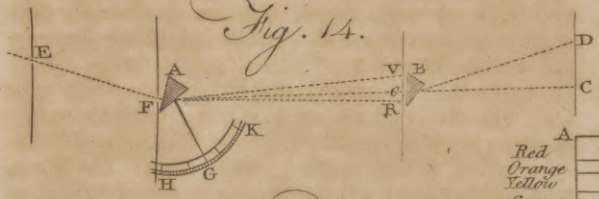


Fig. 13.

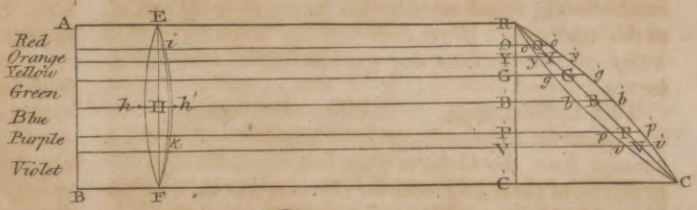


Fig. 18.

Fig. 17.

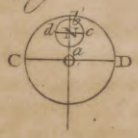


Fig. 16.

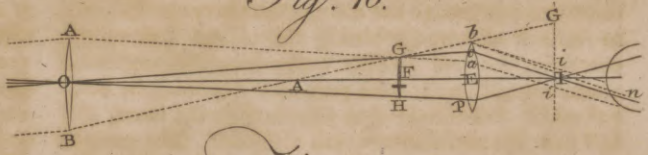


Fig. 21.

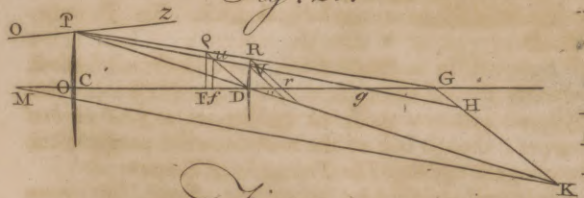


Fig. 19.

Fig. 22.

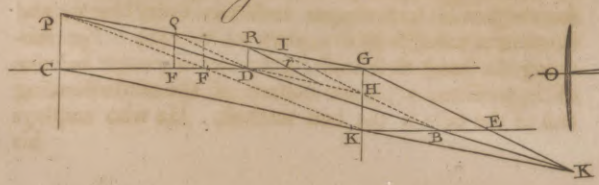
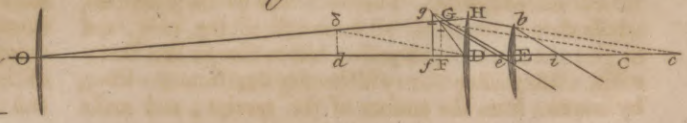


Fig. 20.



W. Train Sculpt.

Fig. 23.

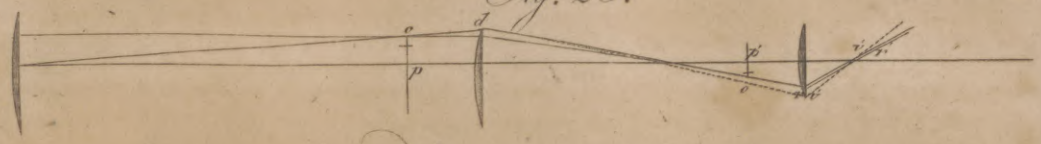


Fig. 24.

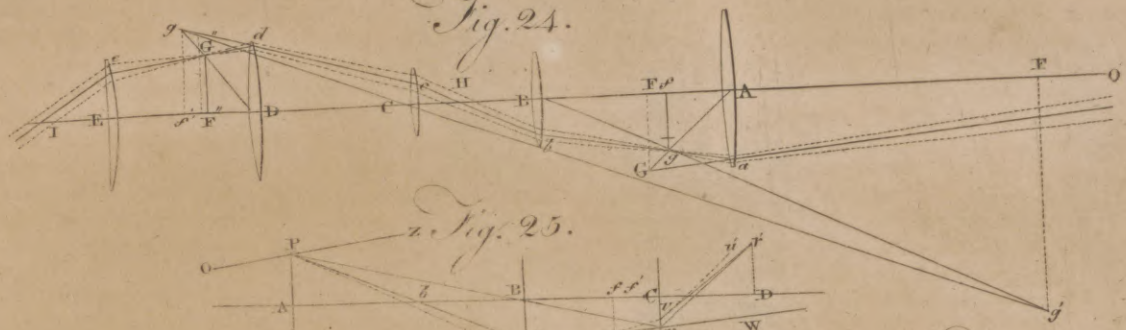


Fig. 25.

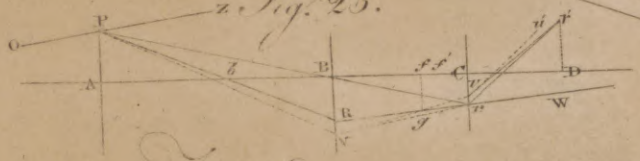


Fig. 26.

Fig. 29.

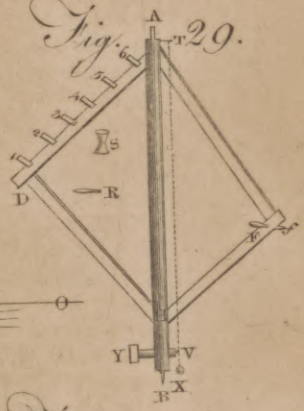


Fig. 28.

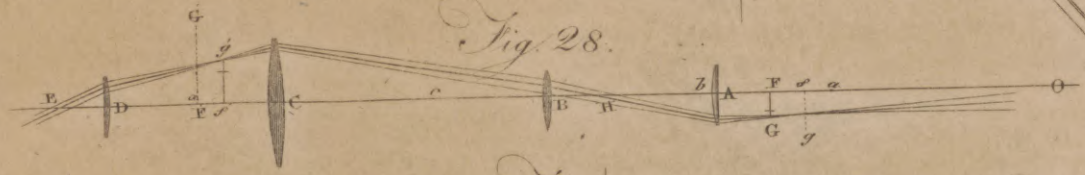


Fig. 27.

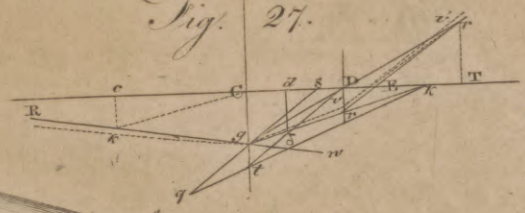


Fig. 31.

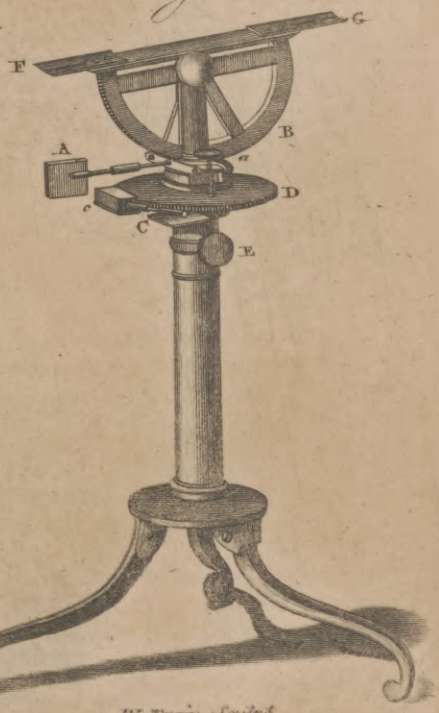
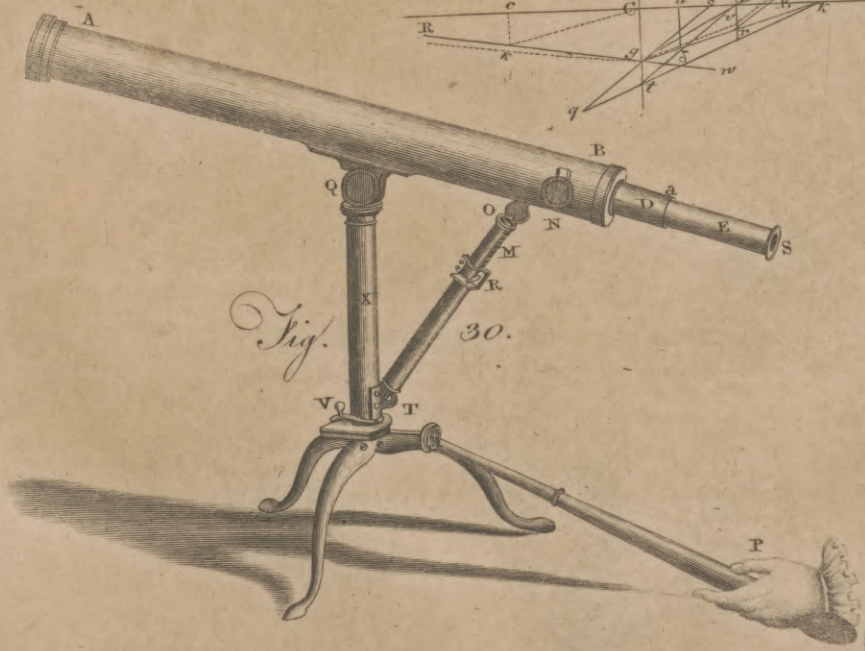


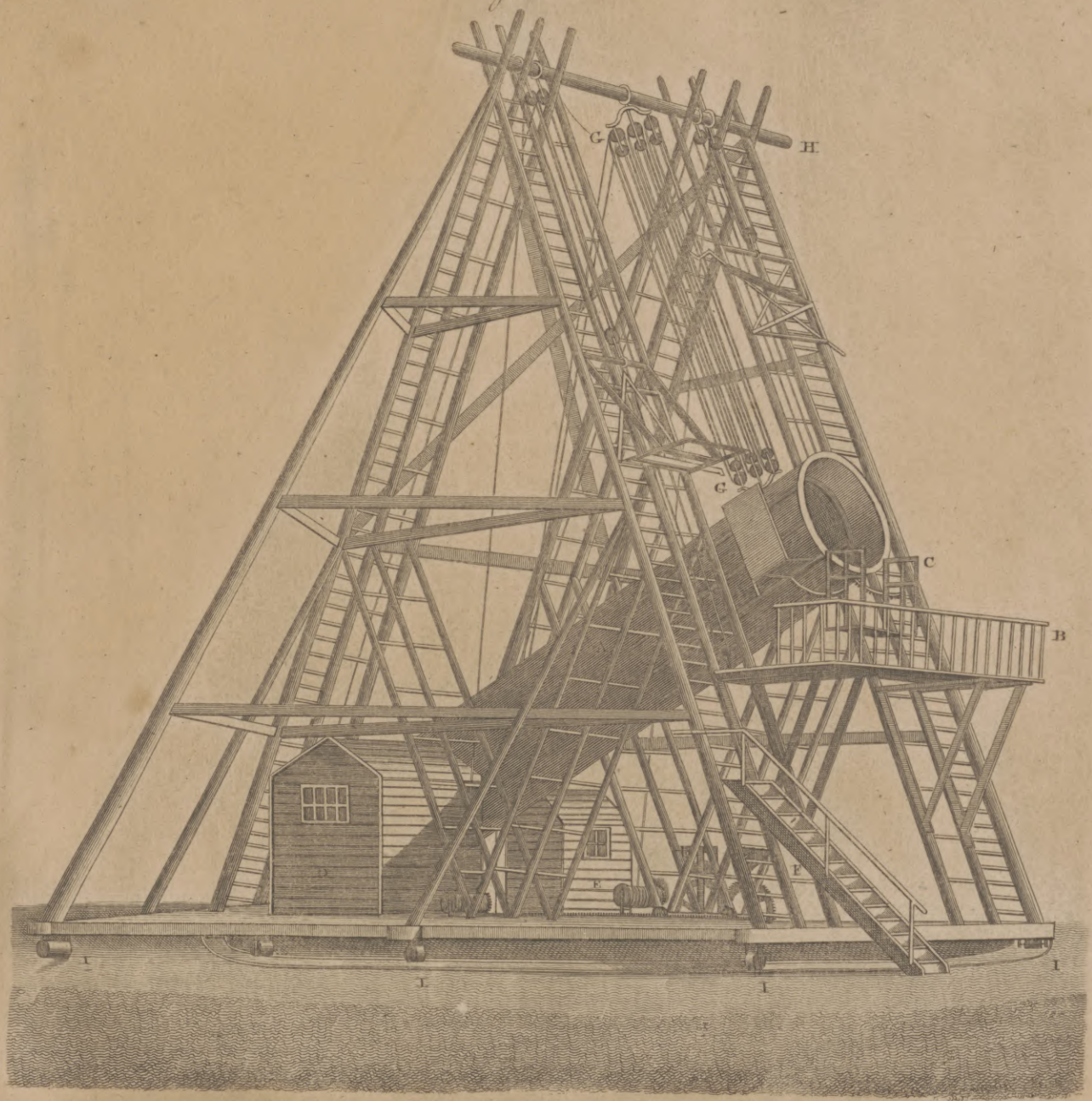
Fig. 30.



Wm. Frain Sculpt.

Herschels Grand TELESCOPE. Fig. 32.

Plate DXXXI.



W. Frain Sculpt.

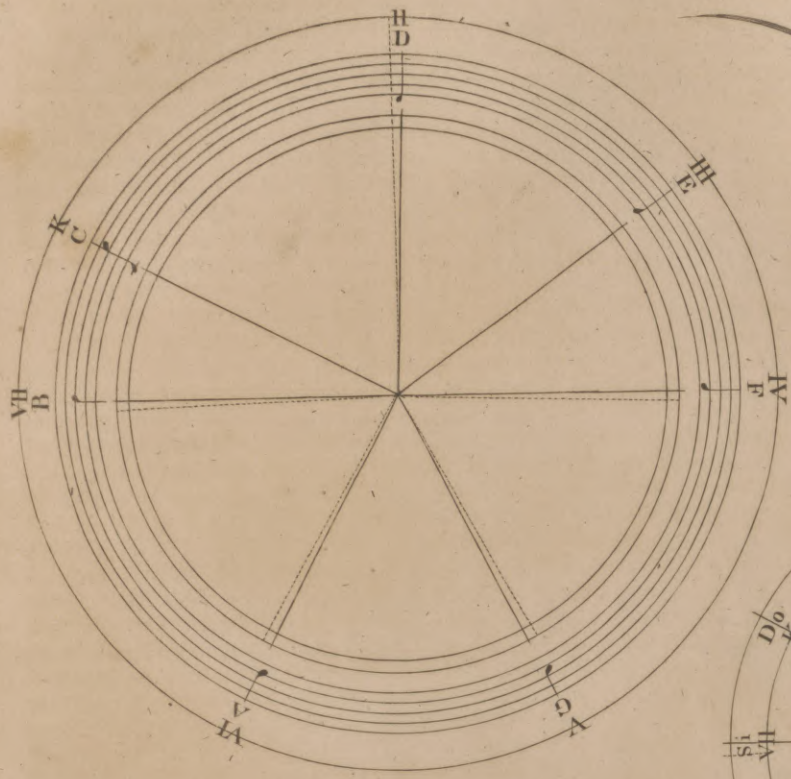


Fig. 1.

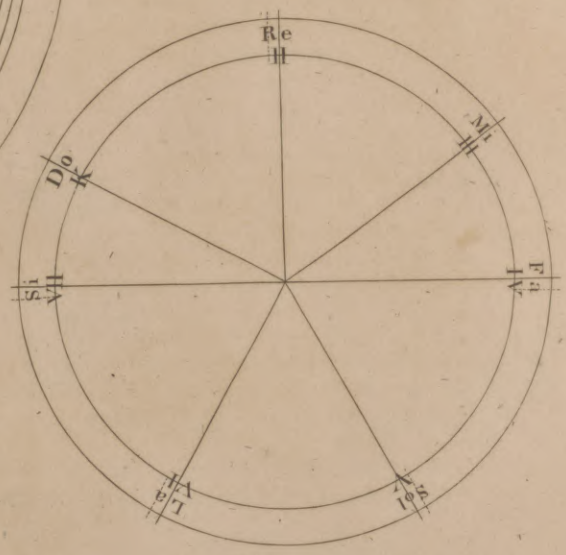
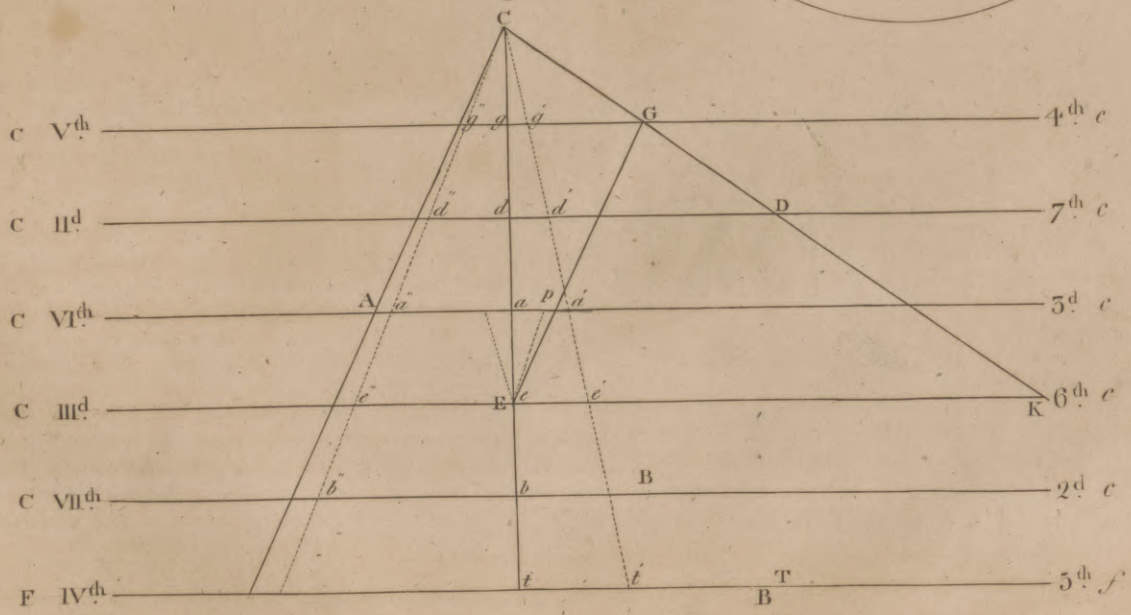


Fig. 2.



E. Mitchell sculp.t

Temper, Temperament.

his time in the ſtudies of elegant literature, or the fine arts, has almoſt always a good temper; whilſt the man who is abſorbed in the purſuits of profound ſcience is apt to acquire a ſeverity of diſpoſition, little leſs diſagreeable, though generally much leſs pernicious, than the capriciouſneſs of the idler. Muſic, painting, and poetry, teach the mind to ſelect the agreeable parts of thoſe objects which ſurround us, and by habituating it to a pure and permanent delight, gradually ſuperinduce an habitual good humour. It is of infinite importance to happineſs to accuſtom the mind, from infancy, to turn from deformed and painful ſcenes, and to contemplate whatever can be found of moral and natural beauty.

So much of the happineſs of private life depends on the government of the temper, that the temper ought to be a principal object of regard in a well-conducted education. The ſuffering of children to tyrannize without controul over ſervants and inferiors, is the ruin of many an amiable diſpoſition. The virtues of humanity, benevolence, humility, cannot be too early enforced; at the ſame time, care ſhould be taken that an infant of two or three years old ſhould never be beaten or ſpoken to harſhly for any offence which it can poſſibly commit.

TEMPERAMENT, among phyſicians, the ſame with conſtitution, or a certain diſpoſition of the ſolids and fluids of the human body, by which it may be properly denominated ſtrong, weak, lax, &c.

In every perſon there are appearances of a temperament peculiar to himſelf, though the ancients only took notice of four, and ſome have imagined theſe were deduced from the theories of the four humours or four cardinal qualities; but it is more probable that they were firſt founded on obſervation, and afterwards adapted to thoſe theories, ſince we find that they have a real exiſtence, and are capable of receiving an explanation. The two that are moſt diſtinctly marked are the ſanguineous and melancholic, viz. the temperaments of youth and age.

1. *Sanguineous.* Here there is laxity of ſolids, diſcoverable by the ſoftneſs of hair and ſucculency; large ſyſtem of arteries, redundancy of fluids, florid complexion; ſenſibility of the nervous power, eſpecially to pleaſing objects; irritability from the plethora; mobility and levity from lax ſolids. Theſe characters are diſtinctly marked, and are proved by the diſeaſes incident to this age, as hæmorrhagies, fevers, &c. but theſe, as they proceed from a lax ſyſtem, are more eaſily cured.

2. *Melancholic Habit.* Here greater rigidity of ſolids occurs, diſcoverable by the hardneſs and criſpature of the hair; ſmall proportion of the fluids, hence dryneſs and leanneſs; ſmall arteries, hence pale colour; venous plethora, hence turgeſcency of theſe, and lividity; ſenſibility, frequently exquiſite; moderate irritability, with remarkable tenacity of impreſſions; ſteadineſs in action and ſlowneſs of motion, with great ſtrength; for exceſs of this conſtitution in maniacs gives the moſt extraordinary inſtance of human ſtrength we know. This temperament is moſt diſtinctly marked in old age, and in males. The ſanguineous temperament of youth makes us not diſtinguiſh the melancholic till the decline of life, when it is very evident, from diſeaſes of the veins, hæmorrhoids, apoplexy, cachexy, obſtructions of the viſcera, particularly of the liver, dropſies, affections of the alimentary canal, chiefly from weaker influence of the nervous power. So much for the ſanguineous and melancholic temperaments; the other two are not ſo eaſily explained. The choleric temperament takes place between youth and manhood. In the

3. *Choleric*, the diſtribution of the fluids is more exactly balanced; there is leſs ſenſibility, and leſs obeſity, with more irritability, proceeding from greater tenſion, leſs mobility and levity, and more ſteadineſs in the ſtrength of the nervous power. As to the

4. *Phlegmatic.* This temperament cannot be diſtinguiſhed by any characters of age or ſex. It agrees with the ſanguineous in laxity and ſucculency. It differs from that temperament, and the melancholic, by the more exact diſtribution of the fluids. Again, it differs from the ſanguineous, by having leſs ſenſibility, irritability, mobility, and perhaps ſtrength, though ſometimes indeed this laſt is found to be great.

Theſe are the ancient temperaments. The temperaments, indeed, are much more various; and very far from being eaſily marked and reduced to their genera and ſpecies, from the great variety which is obſervable in the conſtitutions of different men.

1 Definition.

TEMPERAMENT of the Muſical Scale, is that modification of the ſounds of a muſical inſtrument, by which theſe ſounds may be made to ſerve for different degrees of different ſcales. See MUSIC, Chap. VII.

Temperament, though intimately connected with muſic, is not, properly ſpeaking, a part of that ſcience. The objects of muſic, as a ſcience, are, to aſcertain the laws of muſical ſound, as depending on the powers of the human voice. The purpoſe of temperament is, to regulate, in a way leaſt adverſe to theſe laws, a certain departure from them, rendered neceſſary by the imperfections of inſtruments.

Although the temperament of the ſcale of inſtruments be practically familiar, the true principles on which it depends have been much diſputed. Various opinions have been hazarded, and ſyſtems propoſed. We offer an abridged view of that which appears to us to merit a preference (A).

2 Nature of the true ſcale.

Before conſideration of the tempered ſcale, a ſhort review of the nature of the true ſcale is neceſſary.

3 Notes, and their pitch.

From the conformation of the vocal organs, all nations, in ſinging, make uſe of the ſame inflections of voice. Theſe inflections, called *notes*, are ſaid to be *grave* or *acute*, in proportion to the degree of hoarſeneſs or ſhrillneſs with which they are ſung. The ſtate of voice with reſpect to gravity or acuteneſs with which any one note is ſung, is termed its *pitch*.

4 Uniſons and intervals.

Two notes having the ſame pitch are termed *uniſons*, or are ſaid to be *in-uniſon* to one another. The difference of pitch between any note and another is denominated an *interval*.

(A) Amongſt the very numerous authors on the ſubject of temperament, we have ſelected, for our chief guides, the late Dr Robert Smith of Cambridge, and Profeſſor John Robiſon of Edinburgh.

Temperament.

5 Key note or fundamental.

In all attempts to ſing, the ear, either unconſciouſly, or from the direction of recently hearing it, ſelects a particular note, from the previous impreſſion of which the voice naturally forms other notes, at certain though unequal intervals. The note, thus ſelected, is termed the *key note* or *fundamental*. When choſen, it inſtantly aſſumes a particular and predominant character. The ear involuntarily refers to it the intonation of all other notes, readily recurs to it during performance, and is diſſatisfied unleſs the voice cloſe upon it.

6 Natural ſcale and its degrees.

Where the ſinger has aſſumed a key note, and, after ſinging that note, ſings the note neareſt in acuteneſs to it without forcing the voice, and ſo on, the ſeries of notes, thus naturally formed, conſtitutes what is called the *natural ſcale*. The notes of it are termed its *degrees*; thus the key note is the *firſt degree* of the ſcale; the natural note next in acuteneſs to it, is named the ſecond degree, or *ſecond of the ſcale*, and ſo on.

7 Difference of pitch of the male and female voice.

Two untaught men, attempting to ſing the ſame ſcale together, always ſing in uniſon. But a man and a woman, making the ſame attempt, ſing naturally in ſuch a difference of pitch, although they proceed by the ſame intervals, that the eighth note only of the male voice aſcending, is in uniſon with the key note of the female voice. Were the male voice to aſcend to a ninth note, it would be in uniſon with the ſecond of the female voice; the tenth note of the former would be in uniſon with the third of the latter, and ſo on.

We have thus two ſcales in ſucceſſion, perfectly ſimilar in the relation of the degrees of each to their reſpective key notes; but differing in pitch by the interval between theſe key notes.

8 Octave, what?

This interval, comprehending ſeven ſmaller intervals and eight degrees, is, from this laſt circumſtance, called an *octave*: and this term is alſo applied, ſomewhat inaccurately, to the ſeries of the eight degrees. Thus we ſay, that the *octave* formed by the female voice is an *octave* acuter than that which is produced by the male voice; meaning, that the eight degrees ſung by the woman are acuter by the interval of an octave, than thoſe ſung by the man.

Temperament.

9 All octaves are ſimilar.

Not only are the natural octaves of the male and female voice exactly ſimilar; but the ſame ſimilarity is found in the extremes of the human voice, and, beyond them, as far as muſical ſounds can be produced. Many men can ſing the ſecond octave below, and moſt women the ſecond octave above, a given key note common to both voices. Yet the graveſt octave of ſuch a male voice, and the acuteſt octave of ſuch a female voice, are equally ſimilar in their relations (although they differ in pitch by an interval of two octaves), as the two central octaves are.

10 All muſic contained in one octave of the natural ſcale.

All the different natural inflections of the human voice are thus contained in one octave, ſince all other octaves are only repetitions of the ſame inflections in a graver or acuter pitch.

11 Octave conſiſts of eight degrees and ſeven intervals.

The octave, then, conſiſts of eight degrees and ſeven intervals. Two of theſe intervals, thoſe between the third and fourth, and the ſeventh and eighth degrees, are ſenſibly leſs different in pitch than the others. And although we have no direct meaſures of the pitch of ſounds, we term theſe ſmaller intervals *ſemitonic*, and the others *tonic* intervals, preſuming the latter to be equal to each other, and a ſemitonic interval to be equal to the half of a tonic one.

12 Repreſentation of the ſcale by letters.

The degrees of the natural ſcale are, by Britiſh muſicians, diſtinguiſhed by the firſt ſeven letters of the alphabet. The letter C, for ſome reaſon leſs important than difficult to explain, has been appropriated to the note moſt eaſily aſſumed as a key note by both the male and female voice; the ſecond of the ſcale is termed D, the third E, and ſo on. As the human voice, and conſequently moſt muſical compoſitions, comprehend four octaves, we repreſent the ordinary octave of the male voice by Roman capitals, and that of the female voice by Roman minuſcular letters. The graveſt male octave is diſtinguiſhed by Italic capitals, and the acuteſt female octave by minuſcular Italics. The whole natural ſcale may therefore be exhibited thus:

Graveſt Male Octave.	Ordinary Male Octave.	Ordinary Female Octave.	Acuteſt Female Octave.
*C*D*EF*G*A*BC**	D*EF*G*A*B	c*d*e f*g*a*b	*c*d*e f*g*a*bc.*
1. 2. 34. 5. 6. 71.	2. 34. 5. 6. 71.	2. 34. 5. 6. 71.	2. 34. 5. 6. 78.

In this exhibition, the juxtapoſition of the thirds and fourths, and of the ſevenths and eighths or replicates of the firſt degree, indicates the ſemitonic intervals; and the aſteriſks repreſent the tonic intervals of the natural ſcale, or the artificial intercalary ſounds, which, as we ſhall preſently ſee, it becomes neceſſary to ſubſtitute in thoſe intervals.

13 Different voices require different ſcales.

Were all voices of the ſame compaſs, and were muſical feelings ſatisfied with the natural ſcale, we might reſt here. Being furniſhed with a key note adapted to all voices, and with inſtruments accurately tuned to that key note, it would be unneceſſary to examine whether any other note of the natural ſcale could be aſſumed as the key note of a different ſcale, and if it could, whether any agreeable effect reſulted from the diſcovery.

But the uſe of different ſcales, the key notes of which are derived from the different degrees of the natural ſcales, has been found not only to be one of the chief ſources of the pleaſure imparted by muſical performances, but to be indiſpenſably neceſſary, from the phyſical inequality of voices.

The central 'c' of the ſcale, called in muſic the tenor C, can be produced by every ſpecies of voice. The graveſt male voices, termed baſs, can form this note, but very few notes above it. The treble, or acuter female voice alſo produces it, but ſeldom deſcends farther. The acuter male voices, called tenor, have this 'c' ſcarcely above the middle of their compaſs, and it is not much below the middle of that of the counter-tenor or graveſt female voices. Now it is obvious that an air in the natural ſcale, which ſhould riſe above 'c', and fall below it in the ſame proportions, might be ſung by the tenor or counter-tenor voice, but would be too acute for the baſs voice, and too grave for the treble. Either of theſe voices, in order to execute the ſame air, muſt aſſume a different key note from 'c'; and as all the

Temperament.

the degrees of the ſcale are regulated by the key note, the air muſt of courſe be executed in a ſcale different from that of 'c'.

Again, ſuppoſe a ſinger who can ſing a given air only in the ſcale of B, to be accompanied by an inſtrument tuned in the ſcale of 'c'. Should the lyriſt begin on his own key note, he is a ſemitone above the key note of the ſinger; and ſhould he begin on the note which is in uniſon with the ſinger's key note, the next degree is wrong, being but a ſemitonic interval by the inſtrument, and a tonic interval by the voice. In ſhort, all the degrees but one will be found wrong. This is an evident conſequence of the inequality of the ſemitonic to the tonic intervals; and if the tonic intervals, which we preſume to be equal, be not exactly ſo, the diſcordance will be ſtill greater.

14 Intercalary ſounds neceſſary.

The remedy for this is apparently obvious. If the ſemitonic intervals are each equal to half of any of the tonic intervals, we need only to interpoſe other ſounds between each two of the degrees which form the tonic intervals; and then, in place of eight degrees and ſeven unequal intervals, we ſhall have twelve degrees and twelve equal intervals, each of them equal to a ſemitone. An inſtrument thus furniſhed, appears to be adapted to any voice, and to reſemble the modern harpſichord or organ, which have twelve ſeemingly equal intervals in the octave. Such were the practical reſources of the Greek muſicians, ſanctioned by the approbation of Ariſtoxenus, and of all thoſe who were ſatisfied with the deciſion of the ear alone.

15 Mathematical ratios of muſical intervals.

But philoſophers and mathematicians aſcertained the exiſtence of a certain connexion between muſical intervals and mathematical proportions, and gradually opened the way to the diſcovery that the relations of the muſical ſcale, as naturally formed by the human voice, depend on principles equally plain and certain with the ſimpleſt geometrical propoſitions.

16 Ratios of the octave fifth and fourth.

Pythagoras is ſaid to have diſcovered, that if two muſical chords be in equal tenſion, and if one of them be half the length of the other, the ſhort one will ſound an octave above the long one; if one third ſhorter, it will produce the fifth: if one fourth ſhorter, it will give the fourth. Thus the relation of the key to its octave was diſcovered to correſpond to the ratio of 2 : 1; that of the key to its fifth to be in the ratio of 3 : 2; and that of the key to its fourth to be in the ratio of 4 : 3. For inſtance, if a chord of a given ſize and tenſion, and 12 inches long, produce 'c', another of the ſame ſize and tenſion, but only ſix inches long, will give the octave *c*; one eight inches long will ſound the fifth 'g'; and one nine inches long will produce the fourth 'f'. Now as the ſtring of eight inches giving the fifth, and that of ſix inches producing the octave, are in the ratio of 4 : 3, which is that of the fourth; it follows, that the interval between the fifth and octave is a fourth: and as the chord of nine inches producing the fourth, and the octave of ſix inches, are in the ratio of 3 : 2, the interval between the fourth and octave muſt be a fifth. Thus the octave 'c' *c*, is divided into a fifth 'c g', and a fourth 'g' *c*, or into a fourth 'c f', and a fifth 'f' *c*, both in ſucceſſion. The two fourths 'c f', and 'g' *c*, leave an interval 'f g', correſponding, as we have ſeen, to the ratio of 9 : 8.

Temperament.

17 Ratio of the major third, minor third, and ſemitone.

We have thus the ratios of the octave, of the fifth, and of the fourth; and it does not appear that the ancient theoriſts proceeded farther. They ſeem to have preferred the harmony of fourths and fifths to that of thirds and ſixths, ſo eſſential in modern harmony. By purſuing the ſyſtem of the mathematical ratios, we find that 5 : 4 gives the major third 'c e'. And the fifth 'g' being already determined by the ratio 3 : 2, we aſcertain the ratio of the minor third 'e g' to be 6 : 5, which is the difference between 3 : 2 and 5 : 4. In the ſame way, the ratio of the third 'e' being 5 : 4, and that of the fourth 'f' being 4 : 3, we aſcertain the ratio of the ſemitone 'e f' to be 16 : 15, or 4 : 3—5 : 4.

18 Ratio of the major ſixth and major ſeventh.

A note in the ratio of 5 : 4, or that of a major third to 'f', gives 'a', the major ſixth of the natural ſcale; and a note in the ſame ratio of 5 : 4 to 'g' produces 'b,' the major ſeventh of that ſcale. The ratio of 'g a' will thus be 10 : 9, and that of 'a b' 9 : 8, the ſame with that of 'f g'; and that of 'b' *c* will thus be 16 : 15 like 'e f'.

19 Ratio of the major ſecond.

We have in this way the mathematical ratios of all the degrees of the natural ſcale except that of the ſecond 'd'. Conſidering however, the ſecond to be a perfect fourth graver than the fifth, and having aſcertained the fifth 'g' to be a perfect fourth below *c*, as 2 : 1 is to 3 : 2; ſo 3 : 2 gives 9 : 8, which we take for the ratio of the ſecond.

20 Ariſtoxenean and Pythagorean ſyſtems.

Thus have been formed two diſtinct ſyſtems of intonation of the natural ſcale; that of mean tones and ſemitones, founded on the rules of Ariſtoxenus, and the practice of ancient artiſts, and that of the ratios, deduced from the diſcoveries of Pythagoras, and the calculations of mathematicians.

21 Circular repreſentation of the ſcale.

The difference between the Ariſtoxenean ſyſtem of mean tones and ſemitones, and the Pythagorean ſyſtem of mathematical ratios, will beſt appear from the following conſtruction. Let the circumference of a circle (fig. 1.) be divided by dotted lines (according to the principles of Ariſtoxenus) into five larger and equal intervals, and two ſmaller intervals alſo equal. Let it alſo be divided by full lines into portions determined by means of the muſical ratios. Thus let the arches CD, FG, and AB be proportional to the logarithm of 9 : 8, GA and DE to thoſe of 10 : 9, and EF and BC to thoſe of 16 : 15 (B). Let us divide another circle in the ſame manner; but inſtead of having its points of diviſion marked C.D, &c. let them be marked 'key' 2d, 3d, 4th, 5th, 6th, 7th. This circle, which may be deſcribed on a piece of card, is to be placed on the other, and is to move round their common centre.

Plate DXXXII. Fig. 1.

22 Inſufficiency of the natural ſcale for compoſition in different ſcales.

In whatever point of the outer circle the point 'key' of the inner one be placed, it is obvious that the other points of the outer circle will ſhew what degrees of it, by correſponding with the other points 2d, 3d, &c. of the inner circle, will ſerve for degrees of the ſcale determined by the point 'key.' By this we ſee clearly the inſufficiency of the degrees of the natural ſcale, for the performance of compoſitions in different ſcales, and the

(B) We may make CD = 61°, 72; CE 155°, 9; CE = 149°, 42; CG = 210°, 58; CA = 265°, 3; and CB = 326° 48.

Temperament.

the inefficacy of the Ariſtoxenean remedy of mean tones.

23 Galileo's diſcovery of aërial undulation.

But although the errors of the Ariſtoxeneans were demonſtrated by the certainty of the ratios, and although the dependence of muſical intervals on the latter be ſaid to have been known ſince the days of Pythagoras, the nature of that relation remained unknown for ages. Galileo diſcovered that the ratios expreſs the frequency of the aërial undulation, by which the ſeveral ſounds are generated. He demonſtrated that the vibrations of two chords, of the ſame matter and thickneſs, and of equal tenſion, will be in the ratio of their lengths, and that the number of oſcillations made in a given time will be inverſely as their lengths. The frequency of the ſonorous undulations of the air is therefore inverſely as the length of the ſtring. Thus 2 : 1 being the ratio of the octave, the undulations which produce the acuter ſound are twice as frequent as thoſe which generate the graver. The ratio of the fifth, 3 : 2, indicates that in the ſame time that the ear receives three undulations from the upper ſound, it receives only two from the lower. This is not peculiar to ſounds produced by the vibration of ſtrings: thoſe produced from the vibration of bells, and from the undulation of the air in pipes, are regulated by the ſame law.

24 Pitch of ſound determined by aërial undulations.

Thus, it is demonſtrated that the pitch of muſical ſound is determined by the undulations of the air; and that a certain frequency of undulations produces a certain and unalterable muſical note. It has been found that any noiſe whatever, if repeated 240 times in a ſecond, at equal intervals, produces the tenor 'c'; if 360 times, the 'g', or fifth above. It had been imagined that muſical ſound was only to be produced by thoſe regular undulations, which are occaſioned by the vibrations of elaſtic bodies. We are aſſured that the ſame effect will be produced by any noiſe, if repeated not leſs than 30 or 40 times in a ſecond; and that the experiment has been tried with a quill ſnapping againſt the teeth of a wheel.

25 Chords, conſonant and diſſonant.

By Galileo's diſcovery, the principles on which the juſt intonation of the natural ſcale depends, are ſhown to be certain and plain. To proceed in our ſearch of an exact meaſure of temperament of this perfect intonation, we muſt conſider the nature and effects of conſonant and diſſonant chords.

A chord is a combination of two or more ſimultaneous muſical ſounds. If the coaleſcence be ſo complete that the compound ſounds cannot be diſtinguiſhed, the chord is ſaid to be conſonant; if the ſeparate ſounds are diſtinctly heard, the chord is termed diſſonant.

All conſonances are pleaſing, although ſome are more ſo than others. All diſſonances are unſatisfactory, and ſome are very harſh.

26 Beats, what?

In conſonances, no inequality of ſound is perceptible. In diſſonances, the ear is ſenſible of an alternate increaſe and diminution of the ſtrength of the ſound, without variation of pitch. This is occaſioned by the alternate coincidence and biſection of the vibrations of the component ſounds. For example, ſuppoſe two perfect uniſons produced from two pipes each 24 inches long. Each ſound has 240 vibrations in a ſecond, either exactly coincident, or exactly alternate. In either caſe, the vibrations are ſo frequent and uniform as not to be diſtinguiſhable, and the whole appears one ſound. But let one of the pipes be only 23 inches and ſeven-tenths long, it will give 243 vibrations in a ſecond. Therefore the 1ſt, the 80th, the 160th, and the 240th vibration of the longer pipe, will coincide with the 1ſt, the 81ſt, the 162d, and the 243d of the ſhorter. In the inſtant of coincidence, the aerial agitation produced by the one vibration is reinforced by that produced by the other. The deviations from coincidence gradually increaſe till the 40th vibration of the longer pipe, which will commence in the middle of the 41ſt vibration of the ſhorter one. The vibrations here biſecting each other, the aerial agitations of both will be weakened. The compounded ſound will conſequently be ſtronger at the coincidences and weaker at the biſections of the vibrations. The increaſe of ſtrength, which is termed the *beat*, will recur thrice in every ſecond. Thus the vibrations are in the ratio of 80 : 81, or of a *comma*; and the compounded ſound now ſuppoſed is an uniſon *imperfect by a comma*.

If a third pipe, tuned a perfect fifth to the longer of the two former, be ſounded at the ſame time with the ſhorter, the diſſonance will beat nine times in a ſecond; and is thus ſhown to be a fifth imperfect by a comma.

The perfection or imperfection of any conſonance may thus be aſcertained with equal facility and preciſion: and by this method, any perfect conſonance may be altered to any acquired ſtate of temperament.

27 Beats afford an exact meaſure of temperament.

The theory of beats is therefore valuable, as giving us the management of a phenomenon intimately connected with perfect harmony, as affording us preciſe and practicable meaſures of all deviations from it, and as thus forming the baſis of the moſt accurate ſyſtem of temperament.

For the preparatory proceſs of determining the exact degrees of the ſcale, let us attend to the following ingenious and amuſing experiment.

28 Fundamental experiment.

Let two harpſichord wires be exactly tuned in uniſon at the pitch of the tenor 'c,' to be acted on ſimultaneouſly by a wheel rubbed with roſin, like that of a *vielle*. Let a ſcale of 240 equal parts be deſcribed under one of the ſtrings, equal in length to the ſounding part of it, and numbered from the end at which the wheel is applied. Let a moveable bridge be placed under this ſtring, but ſo as not to alter the tenſion of it in the leaſt.

The two open ſtrings being in perfect uniſon, without any beating whatever, let the moveable bridge be advanced ſlowly from the nut, while the wheel is applied to both ſtrings. All kinds of chords, conſonant and diſſonant, will of courſe be ſucceſſively heard. Between the conſonances there will be a beating, which will increaſe as we approach the conſonance, ceaſe on our reaching it, appear again as we leave it, diminiſh as we recede from it, and again increaſe as we approach to the ſucceeding conſonance.

After this general view, let us more particularly examine the ſeveral degrees of the ſcale.

29 Determination of the octave.

On placing the moveable bridge at 120, we ſhall hear a perfect octave, without any beating. If the diviſion be not quite exact, there will be a little beating; but by ſhifting the bridge very gently to either ſide, the increaſe or diminution of the beating will guide us to the true place, where it will entirely ceaſe.

30 Determination of the perfect fifth.

On placing the bridge at 160, the perfect concord of the

Temperament.

the key and fifth will be heard. Any alteration of the bridge to either ſide will produce a diſagreeable beating.

31 Determination of the perfect fourth.

A rapid flutter in the vicinity of 180 will ceaſe at that point, and give place to the conſonance of the key and fourth.

32 Determination of the major third.

On approaching 192, an angry waſpiſh beating is ſucceeded at that point by the animating concord of the key and major third.

33 Determination of the minor third.

As we leave 192, the beating aſſumes a melancholy character, and ceaſes at 200, the place of the plaintive conſonance of the key and minor third.

34 Determination of the ſecond.

Between that point and the nut, we have only a ſucceſſion of diſcords. As we were at a loſs to aſcertain the mathematical ratio of the ſecond of the ſcale (art. 19), ſo we have ſome difficulty in determining its juſt place by the theory of beats, and the experiment under conſideration. We are uncertain whether we ſhall fix it at a minor tone, or at a major tone above the key. Both form a harſh diſſonance with the key. The major tone, however, is thought leſs diſagreeable: it admits of five more concords in the octave than the minor; and the ratio of it 9 : 8, is that ſuggeſted by the ſimilarity of its interval with the fifth, to the interval of the fifth and octave (art. 19). On theſe accounts we prefer it; and its place in the diviſion under our preciſe conſideration is $213\frac{1}{3}$.

35 Determination of the minor ſixth.

Let the bridge now be placed near, and ſlowly moved to 150: the beatings ſubſide into a conſonance, ſlightly pleaſing, that of the key and minor ſixth.

36 Determination of the major ſixth.

At 144, we have the agreeable concord of the key and major ſixth. From 144 to 120 we hear nothing but diſcord.

37 Determination of the ſeventh.

In this interval, however, we have to find the place of the ſenſible note or major ſeventh. The ear informs us, that the interval between the major ſeventh and the octave, muſt be ſimilar to that between the major third and the fourth. Applying to the former interval the ratio of the latter, that of 16 : 15, we place the moveable bridge at 128; for as 15 is to 16, ſo 120 gives 128. We alſo feel, that the interval between the fifth and major ſeventh is exactly ſimilar to that between the key and major third, of which the ratio is 5 : 4. Now, applying the ſame ratio to 160, the place of the fifth, we find 5 : 4 :: 160 : 128. We thus determine 128 to be the place of the major ſeventh of the ſcale.

Temperament.

38 Ratios of ſimple intervals.

The interval or difference between the minor tone 10 : 9, and the major tone 9 : 8, is 81 : 80, termed *comma*. This interval is not employed in practical muſic, but muſt be diſtinctly underſtood by theoriſts, and particularly in treating of temperament.

There are therefore four deſcriptions of ſimple intervals; that is, intervals which do not include more than a major tone. Theſe are, comma, of which the ratio is 81 : 80; hemitone, or 16 : 15; minor tone, or 10 : 9; and major tone, or 9 : 8 (c).

39 Temperament neceſſary in keyed inſtruments.

We have now to conſider how far the perfect intonation of the natural ſcale muſt be departed from in keyed inſtruments, ſuch as the organ and harpſichord; ſo that the ſame ſound may ſerve for different degrees of different ſcales.

Theſe inſtruments have twelve ſounds in every octave; that is, they have the eight natural degrees and four intercalary ſounds, viz. between C and D, D and E, F and G, G and A, and A and B.

The purpoſe of theſe intercalary ſounds is, that an air may be performed in any pitch; that is, that any ſound may be taken for a key note, and that other ſounds may be found to form the ſcale of that key note, at intervals correſponding to thoſe of the natural ſcale.

Thus, if inſtead of C, the key note of the natural ſcale, we take B for the key note required; A, which is the ſeventh to B, will by no means anſwer for the ſeventh of the aſſumed ſcale; for the interval between A and B is a major tone, of which the ratio is 9 : 8, whereas the interval between the ſeventh of the ſcale and the octave, can only be a hemitone, the ratio of which is 16 : 15. We muſt therefore employ the intercalary ſound between A and B, which in this employment we call A♯, or A ſharp. But we ſhall preſently ſee that we cannot tune even this ſound in the ratio of 16 : 15 with B. For, let us take F for the key note of another ſcale, we find that B will not ſerve for the fourth of that ſcale, being a major tone above A the third; whereas the fourth of the ſcale is only a hemitone above the third. We muſt therefore have recourſe to our intercalary ſound between A and B, which

(c) The logarithmic meaſures of theſe intervals, and of the compound intervals determined in the way which we have deſcribed, are

Comma,	54
Hemitone,	280
Minor tone,	458
Major tone,	512
Minor third,	792
Major third,	969
Fourth,	1249
Fifth,	1761
Minor ſixth,	2041
Major ſixth,	2219
Seventh,	2730
Octave,	3010

The octave being thus divided into 3010 equal parts, a circle of which the circumference is divided into 301 degrees, and a concentric moveable circle having a nonius ſubdividing each into ten parts, will form a convenient inſtrument for examining all temperaments of the ſcale.

Temperament.

which we muſt here call B♭, or B flat, and which ought in this ſtate to be tuned a hemitone above A, or in the ratio of 16 : 15 with that note. Now, this intercalary ſound cannot be both in the ratio of 16 : 15 with A, and in the ſame ratio of 16 : 15 with B. This would extend the whole interval between A and B, to the ratio of about 8 : 7; whereas it ſhould only be in that of 9 : 8. We muſt therefore tune the intercalary ſound in ſuch a diminiſhed relation to A and to B, that it may ſerve either for A♯ or B♭.

But, even independent of theſe intercalary notes, ſome temperament of the natural ſcale is neceſſary.

Let the four fifths, 'c g', 'g' *d*, '*d a*', and '*a ē*', be tuned all perfect. Then tune the two perfect octaves from '*ē*' downwards, '*ē e*', '*e* : e'. The major third 'c e', reſulting from this proceſs, will be too ſharp by a comma, or 81 : 80, and will beat 15 times in a ſecond. The minor third 'e g', and the major ſixth 'c a', will be ſtill more diſcordant.

It is therefore impoſſible to have perfect fifths, and at the ſame time perfect thirds and ſixths. Now, although a perfect fifth, occaſionally employed, be pleaſing, yet the ear does not reliſh a ſucceſſion of perfect fifths; ſuch a ſucceſſion not only renders the harmony languid, but creates a doubt as to the key, which is unſatisfactory. On the other hand, an alternate ſucceſſion of major and minor thirds and ſixths conſtitutes the chief and moſt brilliant part of our harmonics. We therefore find it neceſſary to ſacrifice ſomewhat of the perfect harmony of the fifths to that of the third and ſixths.

It is this accommodation which is properly called TEMPERAMENT; and to this ſyſtem of it, by which the fifths are diminiſhed, and the thirds and ſixths preſerved perfect, we give the preference.

We have juſt ſeen that four conſecutive perfect fifths compoſe an interval, greater, by a comma, than two octaves and a major third. But in the tuning of our inſtruments requiring temperament, theſe intervals muſt be rendered equal. Becauſe, as we have ſeven hemitonic intervals in the fifth, twelve in the octave, and four in the major third; ſo the interval of four-fifths contains twenty-eight hemitonic intervals, and that of two octaves and major third contain alſo twenty-eight, being twenty-four for the two octaves, and four for the major third. The real difference being, however, a comma, it is plain, that if we keep the major thirds perfect, we muſt diminiſh or flatten each of the four-fifths one-fourth of a comma.

It is not eaſy to aſcertain with perfect exactneſs the quarter comma by which the firſt fifth 'c g' is to be diminiſhed. We ſhall, however, be ſufficiently accurate for practical purpoſes if we flatten 'g' till a beating of 9 beats in four ſeconds is produced (D).

Having in this manner tuned 'g', we diminiſh the next fifth 'g' *d*, one-fourth of a comma, by flattening *d* till 'g' *d* beat half as faſt again as 'c g', or $13\frac{1}{2}$ beats in four ſeconds (E).

The next fifth, *d a*, muſt be diminiſhed in the ſame proportion by flattening *a* till '*d a*' beat 15 times in ſix ſeconds.

Inſtead of tuning upward the fifth *a ē*, tune downward (F) the octave *a* 'a', and then tune upward the fifth 'a' *e*, and flatten it till it beat 15 times in eight ſeconds.

If we take 15 ſeconds for the common period of all theſe beats, we ſhall find

The beats of 'c g' = 34
G 'd' = 25
'd a' = $37\frac{1}{2}$
'a *e* = 28

On tuning downwards the octave *e* 'e' we have the major third 'c e' perfect without any beating; and we proceed, tuning upwards a fifth flattened by one-fourth of a comma, and when the beating becomes too quick, tuning downward an octave. We may do this till we reach 'b' ♯, which ſhould be the ſame with *c*, a perfect octave above 'c'.

It will be better, however, to ſtop at 'g' ♯, and then to tune fifths downward from 'c' and octaves upwards, when we get too low. Thus we have 'c' F, F 'f', 'f' *B* ♭, 'B

(D) If any concord, whoſe perfect ratio is $\frac{m}{n}$ (m being the greateſt term of the ſmalleſt integers expreſſing that ratio), be tempered ſharp by the fraction $\frac{p}{q}$ of a comma, and if M and N be the pulſes made by the acute and grave notes of the concord during any number of ſeconds, the number b of beats made in the ſame time by this concord will be $=\frac{2qm\mathrm{N}}{161p-q}$, or $\frac{2qn\mathrm{M}}{161p+q}$; and if it be tempered flat, then, $b=\frac{2qm\mathrm{N}}{161p+q}$, or $\frac{2qn\mathrm{M}}{161p-q}$. (Smith's Harm. 2d edit. p. 82, &c.). Now, let $\frac{m}{n}$ be $=\frac{3}{2}$, the ratio of the fifth; $q=1, p=4$; therefore, $\frac{p}{q}$=one-fourth of a comma, and N='c' or 240 pulſes in a ſecond. Therefore, $\frac{2qm\mathrm{N}}{161\times p+q}=\frac{2\times3\times240}{161\times4+5}=\frac{1440}{645}=2.25$ beats in four ſeconds very nearly.

(E) Becauſe fifths, being in the ratio to each other of 3 : 2, N in this fifth = 360.

(F) The grave octaves of the upper terms of each of theſe tempered fifths may be determined with perfect accuracy, by making the grave octave beat with the lower term of the tempered fifth as often as the upper term does with it; for inſtance, by making G 'c' beat as often as 'c g', &c. For, it has been demonſtrated by Dr Smith, that the upper term of a minor concord beats equally with the lower term, and with the acuter octave of that term; but that the upper term of a major concord beats twice as faſt with the acuter octave of the lower term, as it does with the lower term itſelf. Therefore, as 'g' beats twice as faſt with *c* as with 'c', and is with its grave octave G in the ratio of 2 : 1, G 'c' beats preciſely as often as 'c g'.

Tempera-ment. 'B ♭ 'b ♭', 'b ♭ e ♭'; and this method is preferable, because the notes marked ♯ or ♭, are, when tuned in this way, in the best relation to those with which they are most frequently employed as major thirds, and the major third is the harmonic interval most in use (G). Tempera-ment.

Another system of temperament is that which divides

(G) The process of temperament thus recommended, will be greatly facilitated by employing a pendulum made of a ball of about two ounces weight, sliding on a light deal rod, having at one end a small ring. Let this pendulum be hung by the ring on a peg, and the ball adjusted so as to make 20 vibrations in 15 seconds. This done, mark the rod at the upper edge of of the ball, and adjust it in the same manner for 24, 28, 32, 36, 40, 44, and 48 vibrations. Then having calculated the beats of the different fifths, set the ball at the corresponding mark, and temper the sound till the beats keep pace exactly with the pendulum.

In order to discover, should it be necessary, the number of pulses made in a second by the tuning fork, by which we tune the tenor 'c' of our instrument, let a wire be stretched by a weight till it be unison or octave below the fork; let $\frac{1}{40}$th then be added to the weight. Being thus tempered by a comma, the contemporaneous sounding of the fork and wire will produce a beating; and on multiplying the beats by 80, the product gives the number of pulses of the fork, and consequently of the 'c' of the instrument tuned from it. But the common 'c' tuning forks are so nearly consonant to 240 pulses, that this process is scarcely necessary.

On the system of temperament now proposed, Dr Smith makes the following useful observation and deduction.

The octave consisting of five mean tones and two limmas, it is obvious that by enlarging the tones we diminish the limmas, and that the increment of the tone is two-fifths of the contemporaneous diminution of the limma. Let v represent any minute variation of this temperament: the increment of a mean tone is $2v$, and the contemporaneous diminution of the limma $-5v$. Again, if the tone be diminished by $-2v$, the limma will increase by $-5v$. Let us observe the variations of the intervals in the latter case.

The perfect fifth consisting of three tones and a limma, its variation will be $-6v+5v$, or $-v$. That is, the fifth is flattened by the quantity v. Consequently the fourth is sharpened by that quantity.

The second, being a tone above the key note, and being therefore flattened by $-2v$, the minor seventh is increased by $2v$.

The minor third consisting of a tone and a limma, its variation is $-2v+5v$ or $3v$. Accordingly, that of the major sixth is $-3v$.

The major third, or two tones, is therefore diminished by $-4v$. Consequently the minor sixth is increased by $4v$.

The major seventh, being the inversion of the limma is therefore varied by $-5v$.

The tritone being diminished $-6v$, the false fifth is accordingly $6v$.

On this observation, Dr Smith has founded the following geometrical construction: Divide the straight line CE (fig. 2.) into six equal parts Cg, g d, d a, a E, E b, b t, and intersect the points of division with the six parallel lines g G, d D, &c. representing the intervals arranged according to the system of mean tones and limmas.

Let any length g G, on the first line to the right of the line CE, represent a quarter of a comma, G will thus mark the place of the perfect fifth, and g that of the tempered fifth, flattened by a comma.

Take d D, double of g G, on the second parallel also on the right hand; D will mark the place of the perfect second, and d that of the tempered second, flattened by the half comma d D.

By setting off a A on the third parallel to the left, equal to g G, we have A′ the perfect major sixth, and a the transferred major sixth, sharpened by the quarter comma A a.

The major third being in the system of mean tones kept perfect, the place of that degree will be e.

By taking b B on the fifth line, on the right, equal to g G, we find B to be the place of the perfect major seventh, and b to be that of the tempered major seventh flattened by the quarter comma b B.

And by making t T on the sixth line, to the right, equal to d D, we have the contemporaneous temperament of the tritone flattened by the half comma t T, and of the false fifth, sharpened by that quantity.

Any other straight line C t' drawn from C. across these parallels, will represent, by the intervals g' G, d' D, &c. the temperaments of another system of mean tones and limmas. Since it is plain that the simultaneous variations $g\,g'$, $d\,d$, &c. from the former temperament, are in the just proportions to each other. The straight line thus employed, (C e', or C e''), has therefore been termed the *temperer*.

As the arrangement of the sounds of keyed instruments having only twelve keys for an octave, and meant to be used in different scales, must approach nearly to a system of mean tones, or rather mean limmas, this construction of Dr Smith's is very useful. The temperer points out, not only all the temperaments of the notes with the key note, but also the temperaments of the harmonic concords. Thus it will be seen, that the temperament of the minor third forming the interval between the major third and fifth, is in all cases the same with that of the major sixth and octave, and that the temperament of the major third forming the interval between the fourth and major sixth, is equal to that of the key and major third of the scale.

It has been proposed, in order to render Dr Smith's construction still more useful, that it should be drawn of such a size as to admit of the following supplementary scales.

1. A scale of g G divided into thirteen parts and a half, expressing the logarithmic measures of the temperaments mentioned in the note (C), a comma being = 54.

2. A scale of g G divided into 36 parts, giving the beats made in 16 seconds by the notes c, g, when tempered by any quantity G g'.

3. A

Temperament, Temperance.

the alterations between the fifths and major thirds, flattening the fifths and ſharpening the major thirds, and making both beat equally faſt along with the key: and ſince enlarging the fifth increaſes the tone, and conſequently diminiſhes the limma, the intercalary ſounds become thus better ſuited for their double ſervice of the ſharp of the note below, and the flat of the note above. Much, however, is loſt in the brilliancy of the major thirds, which are the moſt effective concords. The fifths are not much improved, and the ſixths are evidently hurt by this temperament (H).

Theſe methods of tuning by beats are incomparably more exact than by the ear. We cannot miſtake above one beat, that is, in the fifth $\frac{1}{108}$th, and in the major third $\frac{1}{180}$th of a comma.

We have offered a ſhort view of what appears to us to be the preferable ſyſtem of temperament. It has been deduced from the obſervations of the moſt able theoriſts, and will greatly aſſiſt a tuner; but to him there are farther neceſſary, as to a muſical performer, a correct ear, patient attention, and long practice.

TEMPERANCE, that virtue which a man is ſaid to poſſeſs who moderates and reſtrains his ſenſual appetites. It is often, however, uſed in a much more general ſenſe, as ſynonymous with moderation, and is then applied indiſcriminately to all the paſſions.

Temperance (ſays Mr Nelſon) is the virtue that bridles our irregular deſires; it is nearly allied to prudence, and has a cloſe connection with juſtice; it calms revenge, and quenches the fire of unjuſt reſentment; it checks the epicure, and ſtops the riotous hand of the Bacchanalian; it extinguiſhes or abates the flames of luſt, and baniſhes every lawleſs action; it ſilences the flippant detracting tongue, and gives in its ſtead a pleaſing moderation of ſpeech; it ſhuts the door againſt avarice, and proves experimentally, that happineſs does not conſiſt in the eager purſuit or acquiſition of riches, but in a contented mind; it curbs the ſtrongeſt of all other paſſions, gaming, and diſtinguiſhes juſtly the abſurdity and folly of making that a dangerous trade, which was only deſigned as a relaxation and an amuſement: temperance, in a word, is the parent of many virtues; the parent of peace, proſperity, health, and joy.

Nothing can be more ſtrange to all obſervation than the practice of forſaking temperance; ſince every day's experience groves to us, that intemperance produces the oppoſite to what we ſeek. Suppoſe, when a child is born, we aſk the parents what it is they wiſh in that child; they will anſwer, life. But as life alone, that is, mere exiſtence, may, by infirmity or other accidents, be very wretched, they will naturally wiſh for health and happineſs. Well then, life, health, and happineſs, are the general wiſhes of parents for their children. Now let us ſee how their wiſhes are likely to ſucceed. Their firſt ſtep is uſually a ſhameful neglect of the food of nature, the breaſt; the next, a blind gratification of their will; the third, an almoſt total neglect of their manners; and a fourth, the cheriſhing them in every irregular affection. Where then is the wonder that parents are diſappointed? Life and health depend on proper food and other judicious management on one part; and if ſick, an obedience to remedies on the other part; and happineſs eſſentially depends in the firſt place on health; in the next, on the due government of our ſenſes, affections, and paſſions. See here how much mankind deviate from themſelves; how far they depart from their own

---

3. A ſcale of *g* G divided into 60 parts, for the beats of the major third C *e*.
4. A ſcale of *g* G divided into 72 parts, for the beats of the minor third C *e b*.
5. A ſcale of *g* G divided into 48 parts for the beats of the fourth *c f*.
6. A ſcale of *g* G divided into 89 parts for the beats of the minor third *g e*.
7. And, *g* G divided into 80 parts for the beats of the major third *f a*.

Thus provided, and having determined by Dr Smith's conſtruction, the temperament of 'g', 'd', 'a', 'e', 'b', and 'f', the accurate tuning of the whole octave as a ſyſtem of mean tones with perfect major thirds may be completed as follows.

Let 'f ♯' be tuned a perfect major third above 'd'; 'g ♯' a perfect major third above 'e', and *c* ♯ a perfect major third above 'a'.

Let 'b ♭' be tuned a perfect major third below '*d*', and 'e ♭' a perfect major third below 'g'.

(H) To adjuſt the temperer to this mode, let EG (fig. 2.) be divided in *p*, ſo that E *p* may be to *p* G, as 3 to 5. Then draw C *p*, cutting *g* C in *g'*, and C *t'* ſhall be the temperer required. It will be found that E *e'* and G *g'* are each of them 32 of their reſpective ſcales.

Let therefore 'c g' beat	32 times in 16 ſeconds
G 'c	32;
G 'd'	24;
G 'b'	24, and tune 'b' *b*;
'd' *a*	36, and tune *a* 'a'
'd' 'f ♯'	36;
'a' *e*	27;
'a' *c* ♯	27;
e b	$40\frac{1}{2}$, proving 'b' *b*;
e g ♯	$40\frac{1}{2}$;
F 'c'	$21\frac{1}{3}$, and tune F 'f';
FA	$21\frac{1}{3}$, proving A 'a';
B ♭ 'f'	$28\frac{1}{2}$, and tune B ♭ 'b ♭'
'e ♭ b ♭'	$38\frac{1}{2}$;
'C' *c*	perfect.

Temperance, Templars.

own principles. But what is the remedy? Nothing more obvious. Let parents exercise their reason in all the steps they take for their children's welfare; let them examine right and wrong; let them not only avoid passion, but labour to correct their own errors of judgement, that they may be the better enabled to prevent them in their children; but, particularly, let them fix in them the knowledge, love, and habit, of temperance.

TEMPERING, in the mechanic arts, the preparing of steel and iron, so as to render them more compact, hard, and firm; or even more soft and pliant, according to their respective occasions.

TEMPLARS, Templers, or *Knights of the Temple*, a religious order instituted at Jerusalem in the beginning of the 12th century, for the defence of the holy sepulchre and the protection of Christian pilgrims. They were first called *The poor of the Holy City*, and afterwards assumed the appellation of *Templars*, because their house was near the temple. The order was founded by Baldwin II. then king of Jerusalem, with the concurrence of the pope; and the principal articles of their rule were: That they should hear the holy office throughout every day; or that, when their military duties should prevent this, they should supply it by a certain number of pater nosters: that they should abstain from flesh four days in the week, and on Fridays from eggs and milk-meats: that each knight might have three horses, and one esquire: and that they should neither hunt nor fowl. After the ruin of the kingdom of Jerusalem about 1186, they spread themselves through Germany and other countries of Europe, to which they were invited by the liberality of the Christians. In the year 1228, this order acquired stability, by being confirmed in the council of Troyes, and subjected to a rule of discipline drawn up by St Bernard. In every nation they had a particular governor, called *master of the Temple*, or of the *militia of the Temple*. Their grand-master had his residence at Paris.

The order of Templars flourished for some time, and acquired, by the valour of its knights, immense riches and an eminent degree of military renown: but as their prosperity increased, their vices were multiplied, and their arrogance, luxury, and cruelty rose at last to such a monstrous height, that their privileges were revoked, and their order suppressed with the most terrible circumstances of infamy and severity. Their accusers were two of their own body, and their chief prosecutor Philip the Fair of France, who addressed his complaints to Clement V. The pope, though at first unwilling to proceed against them, was under a necessity of complying with the king's desire; so that, in the year 1307, upon an appointed day, and for some time afterwards, all the knights, who were dispersed throughout Europe, were seized and imprisoned, and many of them, after trials for capital crimes, were convicted and put to death. In 1312 the whole order was suppressed by the council of Vienne. A part of the rich revenues they possessed was bestowed upon other orders, especially on the knights of St John, now of Malta, and the rest confiscated to the respective treasuries of the sovereign princes in whose dominions their possessions lay.—The knights Templars, in order to justify the severity with which they were treated, were charged with apostasy to the Saracens, and holding correspondence with them, with insulting the majesty of God, turning into derision the gospel of Christ, and trampling upon the obligation of all laws human and divine. Candidates, it is said, upon admission to this order, were commanded to spit, in token of contempt, upon an image of Christ, and after admission to worship either a cat or a wooden head crowned with gold. It is farther affirmed, that, among them, the odious and unnatural act of sodomy was a matter of obligation; and they are charged with other crimes too horrible to be mentioned, or even imagined. However, though there be reason to believe, that in this order, as well as others of the same period, there were shocking examples of impiety and profligacy; yet that the whole order was thus enormously corrupt, there is no reason to believe. The pope indeed, though he acted with severity, acted with justice. He sent two cardinals to Paris, who, publishing his bull against the order, condemned those Templars who had made the voluntary confession to be burnt by a slow fire. The criminals recanted their former confessions, but acknowledged themselves worthy of death, because they had unjustly accused the order of crimes of which they were innocent. Several authors of those times wrote in defence of the order; and Boccace alleges, that its extirpation was owing to the avarice of the king of France, who coveted the rich possessions the Templars then enjoyed in France.

Templars, Temple.

The king of Arragon was much pressed to treat the Templars in his kingdom as they had been treated in France; but his constant answer was, "We must be first convinced of their guilt, and it will be then time enough to talk of their punishment." The people, however, were in general so provoked against them, that they were compelled to shut themselves up in the fortresses belonging to their order, to prevent their being torn in pieces; which precaution was represented to the king of Arragon as an act of rebellion. He marched, therefore, with a corps of troops against one of these fortresses. The knight who commanded surrendered immediately, and told the king the truth, assuring him that they desired nothing but a fair trial; with which declaration the king was extremely moved, took the whole order into his protection, and forbade any to abuse or insult them under the heaviest penalties. At the same time he declared he was ready to receive any informations against them that were supported by proofs; but if the informers failed therein, he would punish them as they deserved.

These facts plead strongly for the innocence of the Templars, or at least they prove that their guilt must have been exaggerated; and if we add, that many of the accusations advanced against them flatly contradict each other, and that many members of this unfortunate order solemnly avowed their innocence while languishing under the severest tortures, and even with their dying breath—it would seem probable, that King Philip set on foot this bloody tragedy, with a view to gratify his avarice, and glut his resentment against the Templars, and especially against their grand-master, who had highly offended him. The principal cause of his invincible hatred against them was, that in his quarrel with Boniface VIII. the knights espoused the cause of the pope, and furnished him with money to carry on the war. They originally wore a white habit, with red crosses sewed upon their cloaks as a mark of distinction.

TEMPLE, Sir William, was born in London in the

Temple.

the year 1628. The family from which he ſprung was ancient, and is ſaid to have aſſumed the ſurname of Temple from the manor of Temple, in the hundred of Sparken-Hall, in Leiceſterſhire. He was firſt ſent to ſchool at Penſehurſt, in Kent, under the care of his uncle, the celebrated Dr Hammond, then miniſter of that parith; but at the age of ten he was removed thence to a ſchool at Biſhop-Stortford, in Hertfordſhire. When he had acquired a ſufficient knowledge of the Greek and Latin, he returned home at the age of fifteen; and, two years after, he went to Cambridge, where he was placed under the tuition of the learned Dr Cudworth, then fellow of Emanuel college. His father, Sir John Temple, being a ſtateſman, ſeems to have deſigned him for the ſame way of life; and on this account, after reſiding at Cambridge two years, which were principally ſpent in acquiring a competency of French and Spaniſh, both languages exceedingly uſeful for his intended purſuits, he was ſent abroad to finiſh his education.

Mr Temple began his travels by viſiting France in 1648. As he choſe to paſs through the Iſle of Wight, where his majeſty was detained a priſoner, he there accidentally met with the ſecond daughter of Sir Peter Oſborn of Chickſand, in Bedfordſhire, then governor of Guernſey for the king; and his lady being on a journey with her brother to St Maloes, where their father then was, our young traveller joined their party. This gave riſe to an honourable attachment, which at the end of ſeven years, concluded in a happy marriage. Having reſided two years in France, and learned the French language perfectly, Mr Temple made a tour through Holland, Flanders, and Germany, during which he became completely maſter of the Spaniſh. In 1654 he returned from the continent, and, marrying Miſs Oſborn, paſſed his time in retirement with his father, his two brothers, and a ſiſter, then in Ireland, happy in that perfect harmony which has been ſo often remarked in their family.

As he rejected all offers made him of employment under Cromwell, the five years which he lived in Ireland were ſpent chiefly in improving himſelf in hiſtory and philoſophy; but at the Reſtoration, in 1660, being choſen a member of the convention there, while others were trying to make their court to the king, Mr Temple oppoſed the poll-bill with ſo much ſpirit, that his conduct ſoon attracted the attention of the public, and brought him into notice. In the ſucceeding parliament, in 1661, he was elected with his father for the county of Carlow; and in the year following, he was choſen one of the commiſſioners to be ſent from that parliament to the king, which gave him an opportunity of waiting on the duke of Ormond, the new lord-lieutenant, then at London. Soon after he went back to Ireland, but with a reſolution of quitting that kingdom, and of removing with his family to England.

On his return he met with a very favourable reception from the duke of Ormond; and ſoon acquired ſuch a conſiderable ſhare in his eſteem, that the duke complained of him as the only man in Ireland that had never aſked any thing from him. When he mentioned his deſign of carrying his family to England, his grace ſaid, that he hoped he would at leaſt give him leave to write in his favour to the two great miniſters, Clarendon then lord chancellor, and the earl of Arlington, who was ſecretary of ſtate. This the duke did in ſuch ſtrong terms, as procured him the friendſhip of theſe two noblemen, as well as the good opinion of the king. Mr Temple, however, made no other uſe of this advantage than to tell Lord Arlington, that if his majeſty had any employment abroad, which he was fit for, he ſhould be happy to undertake it; but, at the ſame time, he requeſted that he might not be ſent into any of the northern climates, to which he had a very great averſion. Lord Arlington replied, he was very ſorry he had made ſuch an objection, as there was no other employment then undiſpoſed of except that of going envoy to Sweden. However, in 1665, about the beginning of the firſt Dutch war, Lord Arlington ſent a meſſenger to acquaint him that he muſt immediately come to his houſe; which he did, and found that his lordſhip's buſineſs was to tell him, that the king had occaſion to ſend ſome perſon abroad upon an affair of the utmoſt importance, and that he had reſolved to make him the firſt offer; but that he muſt know, without delay, and without telling him what it was, whether he would accept of it, and that he muſt be ready to ſet out in two or three days, without mentioning it to any of his friends. After a little conſideration, Mr Temple told his lordſhip, that, as he took him to be his friend, and as he had adviſed him not to refuſe, as it would be an entrance into his majeſty's ſervice, he ſhould conſult no farther. This buſineſs was to carry a ſecret commiſſion to the biſhop of Munſter; which he ſet out with on the ſecond of Auguſt, and executed it ſo much to the ſatisfaction of Charles II. that, on his return to Bruſſels, his majeſty appointed him reſident there, and created him a baronet. As Bruſſels was a place which he had long wiſhed to reſide at, in April 1666 he ſent for his family; but, before their arrival, he had been again obliged to depart upon buſineſs to the prelate's court: for the biſhop having liſtened to terms of accommodation with France, Sir William wrote two letters to diſſuade him from that alliance; and theſe not having the deſired effect, he went in diſguiſe to Munſter, where, though he arrived too late to ſecure the prince in his firſt engagement, yet he prevailed on him to permit five or ſix thouſand of his beſt troops to enter into the Spaniſh ſervice. In this journey he paſſed for a Spaniſh envoy, having twenty Spaniſh guards to attend him. In this manner he firſt went to Duſſeldorp, where the duke of Newburgh, though in the French intereſt, gave him a guard to Dortmund; but when he reached that place, finding the gates ſhut, he was forced to proceed to a village, at the diſtance of a league, which being full of Brandenburgh troops, he was under the neceſſity of lodging in a barn, upon a ſtraw bed, with his page for a pillow. Next day he was entertained at a caſtle belonging to the biſhop of Munſter, by one Gorges a Scotch lieutenant-general in that prelate's ſervice, with what he calls a very epiſcopal way of drinking. The general coming to the large hall, in which ſtood a great many flaggons ready charged, he called for wine to drink the king's health. A ſilver bell, that might hold about two quarts, was upon this brought him; and, as ſoon as he received it, he pulled out the clapper, and giving it to Sir William, to whom he intended to drink, ordered the bell to be filled. When he was done, he drank off the contents to his majeſty's heath; and aſked Sir William for the clapper, put it on, and turning down the bell, rang it, to ſhew that he had drank fair, and

and left nothing in it. He then took out the clapper, desired Sir William to give it to whomsoever he pleased; and, ordering the bell to be filled again, presented it to Sir William: but as the latter seldom used to drink, he had generally some gentleman with him to supply his place in this respect whenever it might be necessary. Having finished his business at Munster, he returned to Brussels, where he passed a year with great pleasure and satisfaction.

Two months after the conclusion of the peace with the Dutch at Breda, Sir William's sister, who resided with him at Brussels, being very desirous of seeing Holland, he went thither incognito to gratify her desire; but while he was at the Hague, he paid a private visit to Mr De Witt, in which he laid the foundation of that close intimacy which afterwards subsisted between them.

In the spring of 1667, a new war breaking out between France and Spain, which exposed Brussels to the danger of falling into the hands of the former, Sir William sent his lady and family to England; but he himself remained there with his sister till the Christmas following, when he was ordered by the king to come over privately to London. Taking the Hague in his way, he paid another visit to De Witt, and, pursuant to his instructions, proposed those overtures to him which produced the triple alliance. Soon after his arrival at the British court, he returned, on the 16th of January 1668, with the character of envoy extraordinary and plenipotentiary to Holland; where a conference being opened, he brought that treaty to a perfect conclusion in the short space of five days. The ratifications of this alliance being exchanged on the 15th of February, he repaired to Brussels; and a treaty being set on foot between France and Spain at Aix-la-Chapelle, he set out for that place on the 24th of April in quality of his majesty's ambassador extraordinary and mediator. Here he arrived on the 27th: and it was chiefly owing to his assistance that the Spaniards were brought to sign the articles of that peace on the second of May. This service being completed, he returned to Brussels, with a view of remaining there in his former station of resident; but he received letters from the earl of Arlington, with the king's order to continue as ambassador, and to serve his country in that quality in Holland, as on account of the late alliances, his majesty was resolved to renew a character which the crown of England had discontinued there since the time of King James. Sir William being now left at liberty to return to England, embraced the opportunity; and, upon his arrival at London, he was received with every possible demonstration of favour both by the king and the court.

Setting out again for Holland, with his new character of the king's ambassador, he arrived at the Hague in the end of August 1668. Here he enjoyed the confidence of that great minister De Witt, and lived in great intimacy with the prince of Orange, who was then only eighteen years of age; but, in September 1669, he was hurried back to England by Lord Arlington, who ordered him to put his foot in the stirrup as soon as he should receive his letter. When Sir William waited on the earl, he found that he had not one word to say to him; for, after making him attend a long time, he only asked a few indifferent questions respecting his journey. Next day he was received as coolly by the king; but the secret soon came out, and he pressed to return to the Hague, and pave the way for a war with Holland. This, however, he excused himself from having any hand in; which so much provoked the lord treasurer Clifford, that he refused to him an arrear of two thousand pounds due from his embassy. Disgusted with Arlington's behaviour, which was so unlike the friendship he had formerly professed, Sir William now retired to his house at Sheen near Richmond, in Surry; and in this retreat, when free from the hurry of business, he wrote his Observations on the United Provinces, and one part of his Miscellanies, in the time of the second Dutch war. About the end of summer, however, 1673, the king wishing to put an end to the war, sent for Sir William, and desired him to go to Holland to negotiate a peace; but powers having been sent from thence at this time to the Marquis de Fresno, the Spanish ambassador at London, Sir William was ordered to confer with him; and a treaty was accordingly concluded in three days, and the point carried respecting the superiority of the British flag, which had been so long contested. In June 1674 he was again sent ambassador to Holland to offer the king's mediation between France and the confederates, then at war, which was accepted not long after; Lord Berkeley, Sir William Temple, and Sir Leoline Jenkins, being declared ambassadors and mediators; and Nimeguen, which Sir William had proposed, was at length agreed upon by all parties to be the place of treaty. During his stay at the Hague, the prince of Orange, who was fond of the English language, and of the plain English way of eating, constantly dined and supped once or twice a week at his house; and by this familiarity he so much gained the prince's confidence and esteem, that he had a considerable hand in his marriage with the Princess Mary, daughter of James II.

In July 1676 he removed his family to Nimeguen, where he spent the remainder of that year without making any progress in the treaty; and the year following his son was sent over with letters from the lord-treasurer, ordering him to return, and succeed Mr Coventry as secretary of state. In consequence of this order, Sir William came over to England in the spring of 1677; and though the affair of the secretary's place was dropped at his desire, he did not return to Nimeguen that year. About this time, the prince having the king's leave to come over, he soon after married the Princess Mary; and this gave occasion for a new coolness between Lord Arlington and Sir William, as he and the lord-treasurer Osborn, who was related to Sir William's lady, were only privy to that affair. After the prince and princess were gone to Holland, as the court always seemed inclined to favour France, the king wished to engage Sir William in some negociations with that crown: but he was so ill satisfied with this proposal, that he offered to give up all pretensions to the office of secretary; and desiring the lord-treasurer to acquaint his majesty with his intentions, retired to Sheen, in hopes of being taken at his word. Upon a discovery, however, of the French designs not to evacuate the Spanish towns agreed by the treaty to be delivered up, the king commanded him to go upon a third embassy to the states; with whom he concluded a treaty: by which England engaged, in case France refused to evacuate the towns in forty days, to declare war immediately

Temple.

ately against that nation; but before half that time was elapsed, one Du Cross was sent from the English court to Holland upon a business which damped all the good humour excited by the treaty there, and which produced such sudden and astonishing changes in this country, as gave Sir William a distaste for all public employments.

In 1679 he went back to Nimeguen, where the French delayed to sign the treaty till the last hour; but having concluded it, he returned to the Hague, whence he was soon after sent for to enter upon the secretary's office, which Mr Coventry at length resolved to resign. He accordingly came over, and went to court, as all his friends hoped, with a full intention of assuming his office; but he started some difficulty, because he had not a seat in the house of commons, thinking that, by his not being a member, the public business would suffer at such a critical time, when the contests between the two parties ran so high that the king thought fit to send the duke of York into Flanders, and the parliament to put the lord-treasurer Danby into the Tower. After this his majesty still pressed Sir William to be secretary of state; using as an argument for his compliance, that he had nobody to consult with at a time when he had the greatest need of the best advice. Notwithstanding all this, Sir William declined the king's offer, advising him to choose a council in whom he could confide, and upon whose abilities he could depend. This advice the king followed; and the choice of the persons being concerted between his majesty and Sir William, the old council was dissolved four days after, and the new one established, of which the latter was a member.

In 1680 the councils began again to be changed, on the king's illness, at the end of summer, and the duke of York's return privately to court. In this juncture Sir William, endeavouring to bring to the king's favour and business some persons to whom his majesty had taken a dislike, if not an aversion, he met with such treatment from them as gave him a fresh distaste to the court, at which he seldom made his appearance; so that he resided principally at Sheen. Soon after this the king sent for him again; and having proposed that he should go as ambassador into Spain, Sir William consented: but when his equipage was almost ready, and part of the money paid down for it, the king changed his mind, and told him that he would have him defer his journey till the end of the session of parliament, in which he was chosen a member for the university of Cambridge. In this session the spirit of party ran so high that it was impossible to bring the house to any kind of temper. The duke was sent into Scotland; but this would not satisfy them, nor any thing but a bill of exclusion; which Sir William strenuously opposed, saying, that "His endeavour ever should be to unite the royal family, and that he would never enter into any councils to divide them." Not long after this period, the parliament being dissolved by his majesty, without the advice of his privy council, and contrary to what he had promised, Sir William made a bold speech against it; for which he was very ill used by some of those friends who had been most earnest in promoting the last change in the ministry. Upon this he grew quite tired of public business, declined the offer he had of again serving for the university in the next parliament, that was soon after called, and met at Oxford; and seeing his majesty resolved to govern without his parliament, and to supply his treasury through another channel, he retired to Sheen a few days after, whence he sent word by his son, that "he would pass the rest of his days like a good subject, but would never more meddle with public affairs." From that time Sir William lived at this place till the end of that reign and for some time in the next; when having purchased a small seat, called *Moor Park*, near Farnham in Surry, which he conceived a great fondness for, on account of its solitude and retirement, and its healthy and pleasant situation, and being much afflicted with the gout, and broken with age and infirmities, he resolved to spend the remainder of his life in this agreeable retreat. In his way thither, therefore, he waited on King James, who was then at Windsor, and begged his favour and protection to one "that would always live as a good subject, but, whatever might happen, never again enter upon any public employment;" desiring his majesty to give no credit to any thing he might hear to the contrary. The king, who used to say that Sir William Temple's character was always to be believed, promised him whatever he desired, gently reproached him for not entering into his service, which, he said, was his own fault; and kept his word as faithfully to Sir William as Sir William did to his majesty, during the surprising turn of affairs that soon after followed by the arrival of the prince of Orange. At the time of this happy revolution, in 1688, Moor-Park becoming unsafe, as it lay in the way of both armies, he went back to the house at Sheen, which he had given up to his son; to whom he refused leave, though importunately begged, to go and meet the prince of Orange at his landing: but after King James's abdication, when the prince reached Windsor, he went thither to wait upon his highness, and carried his son along with him. The prince pressed him to enter into his service, and to be secretary of state; but his age and infirmities confirming him in the resolution he had made not to meddle any more with public affairs, he was satisfied that his son alone should enjoy his majesty's favour. Mr John Temple was upon this appointed secretary at war; but he had hardly been a week in that office, when he resolved to put an end to his own existence; which he did on the 14th of April 1689, by throwing himself out of a boat, hired for that purpose, in shooting London-bridge; having first put stones into his pocket to make him sink speedily.

In 1694 Sir William had the misfortune to lose his lady, who was a very extraordinary woman, as well as an affectionate wife. He was then considerably turned of sixty; at which age he practised what he had so often declared to be his opinion, that "an old man ought then to consider himself of no farther use in the world except to himself and his friends." After this he lived four years very much afflicted with the gout; and his strength and spirits being worn out by the infirmities of age, he expired in the month of January 1698. He died at Moor-Park, where his heart was buried in a silver box under the sun dial in his garden, opposite to a window from which he used to contemplate and admire the works of nature, with his sister, the ingenious Lady Gifford. This was according to his will; in pursuance of which his body was privately interred in Westminster Abbey, and a marble monument erected in 1722, after the

Temple. the death of Lady Gifford, who resembled him in genius as well as in person, and left behind her the character of one of the best and most constant friends in the world.

Sir William Temple's principal works are, 1. Memoirs from 1672 to 1692: They are very useful for those who wish to be acquainted with the affairs of that period. 2. Remarks upon the State of the United Provinces. 3. An Introduction to the History of England: This is a Sketch of a General History. 4. Letters written during his last embassies. And, 5. Miscellanies, which contain a great many curious pieces that display considerable depth of thought. He was an accomplished gentleman, a sound politician, a patriot, and a great scholar. And if this great idea should perchance be shaded by some touches of *vanity* and *spleen*, the reader will be so candid as to consider, that the greatest, wisest, and the best of men, have still some failings and imperfections which are inseparable from human nature.

TEMPLE, *Templum*, a public building, erected in honour of some deity, either true or false; and wherein the people meet to pay religious worship to the same. The word is formed from the Latin *templum*, which some derive from the Greek τεμενος, signifying the same thing; and others from τεμνω, *abscindo*, "I cut off, I separate," in regard a temple is a place separated from common uses; others with more probability derive it from the old Latin word *templare*, "to contemplate." It is certain the ancient augurs gave the name *templa* to those parts of the heavens which were marked out for the observation of the flight of birds. Their formula was this: *Templa tesqua sunto*. Temples were originally all open, and hence received their name. See Phil. Trans. N° 471. sect. 5. where we have an account of an ancient temple in Ireland of the same sort as our famous Stonehenge. The word *templum*, in its primary sense among the old Romans, signified nothing more than a place set apart and consecrated by the augurs, whether inclosed or open, in the city or in the fields.

Clemens Alexandrinus and Eusebius refer the origin of temples to the sepulchres built for the dead. This notion has been lately illustrated and confirmed by a variety of testimonies by Mr Farmer in his Treatise on the Worship of Human Spirits, p. 373, &c. Herodotus and Strabo will have the Egyptians to have been the first who built temples to the gods. The first erected in Greece is ascribed to Deucalion, by Apollonius, Argonaut. lib. iii. In antiquity we meet with many people who would not build any temples to their gods for fear of confining them to too narrow bounds. They performed their sacrifices in all places indifferently, from a persuasion that the whole world is the temple of God, and that he required no other. This was the doctrine of the magi, followed by the Persians, the Scythians, the Numidians, and many other nations mentioned by Herodotus, lib. i. Strabo, lib xv. and Cicero in his second oration against Verres.

The Persians, who worshipped the sun, believed it would wrong his power to inclose him in the walls of a temple, who had the whole world for his habitation; and hence, when Xerxes ravaged Greece, the magi exhorted him to destroy all the temples he met with.

The Sicyonians would build no temple to their goddess Coronis; nor the Athenians, for the like reason, erect any statue to Clemency, who, they said, was to live in the hearts of men, not within stone walls.

The Bithynians had no temples but the mountains to worship on; nor had the ancient Germans any other but the woods.

Even some philosophers have blamed the use and building of temples, particularly Diogenes, Zeno, and his followers the Stoics. But it may be said, that if God hath no need of temples, men have need of places to meet in for the public offices of religion: accordingly temples may be traced back even into the remotest antiquity. See *Hospinian de Origine Templorum*.

The Romans had several kinds of temples; whereof those built by the kings, &c. consecrated by the augurs, and wherein the exercise of religion was regularly performed, were called, by way of eminence, *templa*, "temples." Those that were not consecrated, were called *ædes*. The little temples, that were covered or roofed, they called *ædiculæ*. Those open, *sacella*. Some other edifices, consecrated to particular mysteries of religion, they called *fana* and *delubra*.

All these kinds of temples, Vitruvius tells us, had other particular denominations, according to the form and manner of their construction, as will be hereafter specified.

Indeed the Romans outdid all nations with regard to temples: they not only built temples to their gods, to their virtues, to their diseases, &c. but also to their emperors, and that in their life time; instances whereof we meet with in medals, inscriptions, and other monuments. Horace compliments Augustus hereupon, and sets him above Hercules and all the heroes of fable; because those were admitted into temples only after their death, whereas Augustus had his temples and altars while living.

Præsenti tibi maturos largimur honores;
Jurandasque tuum per nomen ponimus aras.
Epist. ad. Aug.

Suetonius, on this occasion, gives an instance of the modesty of that emperor, who would allow of no *temples* being erected to him in the city; and even in the provinces, where he knew it was usual to raise temples to the very proconsuls, refused any but those erected in the name of Rome as well as his own.

The most celebrated temples among the Romans were the Capitol and Pantheon. They had also the temple of Saturn, which served for the public treasury; and the temple of Janus.

The temple at Jerusalem was similar in its plan to the TABERNACLE. The first temple was begun by Solomon about the year of the world 2992, and before Christ 1012 according to some chronologers, and finished in eight years. Great mistakes have been committed respecting the dimensions of this temple, by confounding the emblematical description of Ezekiel with the plain account of it in the books of Kings and Chronicles. It consisted of the holy of holies, the sanctuary, and a portico. The holy of holies was a square room of 20 cubits; the sanctuary, or holy place, was 40 cubits long and 20 broad, consequently the length of both these together was 60 cubits. The portico, which stood before the sanctuary, was 20 cubits long and 10 cubits broad. Whether the portico was separated by a wall from

Temple.

from the rest of the temple or not, is not mentioned in scripture. If it was, the whole length of the temple, computing the cubit at 22 inches, did not exceed 110 feet in length and 36 feet 8 inches in breadth. In the portico stood the two brazen pillars called *Jachin* and *Boaz*, which, upon comparing and reconciling the seemingly different accounts in different places, appear to have been 40 cubits high and about 4 cubits diameter. The court probably at first extended all round the temple. Now we are told, that the court about the tabernacle was 100 cubits long and 50 broad; and as Solomon made every part of the temple about twice as large as the corresponding part in the tabernacle, we have reason to conclude, that the court around the temple was 200 cubits long and 100 broad. According to this description, which is taken from the scripture history, the temple of Solomon was by no means so large as it is commonly represented. Still, however, it was very magnificent in size and splendid in ornament. It was plundered of its treasures in the reign of Rehoboam, and repaired by Joash; it was again spoiled in the time of Ahaz and of Hezekiah; and after being restored by Josiah, was demolished by Nebuchadnezzar in the year of the world 3416, after it had stood 476 years according to Josephus, and according to Usher 428 years.

The second temple was built by the Jews, after their return from the Babylonish captivity, under the direction and influence of Zerubbabel their governor, and of Joshua the high-priest, with the leave and encouragement of Cyrus the Persian emperor, to whom Judea was now become a tributary kingdom. According to the Jews, this temple was destitute of five remarkable appendages, which were the chief glory of the first temple; viz. the ark and mercy-seat, the Shechinah, the holy fire on the altar, which had been first kindled from heaven, the urim and thummim, and the spirit of prophecy. This temple was plundered and profaned by Antiochus Epiphanes, who also caused the public worship in it to cease; and afterwards purified by Judas Maccabæus, who restored the divine worship; and after having stood 500 years, rebuilt by Herod, with a magnificence approaching to that of Solomon's. Tacitus calls it *immensæ opulentiæ templum;* and Josephus says, it was the most astonishing structure he had ever seen, as well on account of its architecture as its magnitude, and likewise the richness and magnificence of its various parts and the reputation of its sacred appurtenances. This temple, which Herod began to build about 16 years before the birth of Christ, and so far completed in nine years and a half as to be fit for divine service, was at length destroyed by the Romans on the same month and day of the month on which Solomon's temple was destroyed by the Babylonians.

Maurice's Indian Antiquities, vol. iii. p. 352.

The Indian temples, or pagodas, are sometimes of a prodigious size. They are commonly erected near the banks of the Ganges, Kistna, or other sacred rivers, for the benefit of ablution in the purifying stream. Where no river flows near the foot of the pagoda, there is invariably in the front of it a large tank or reservoir of water. These are, for the most part, of a quadrangular form, are lined with freestone or marble, have steps regularly descending from the margin to the bottom, and Mr Crauford observed many between three and four hundred feet in breadth. At the entrance of all the more considerable pagodas there is a portico, supported by rows of lofty columns, and ascended by a handsome flight of stone steps; sometimes, as in the instance of Tripetti *, to the number of more than a hundred. Under this portico, and in the courts that generally inclose the whole building, an innumerable multitude assemble at the rising of the sun; and, having bathed in the stream below, and, in conformity to an immemorial custom over all the East, having left their sandals on the border of the tank, impatiently await the unfolding of the gates by the ministering brahmin. The gate of the pagoda universally fronts the east, to admit the ray of the solar orb; and, opening, presents to the view an edifice partitioned out, according to Mr Thevenot in his account of Chitanagar, in the manner of the ancient cave-temples of Elora, having a central nave or body; a gallery ranging on each side; and, at the farther end, a sanctuary, or chapel of the deity adored, surrounded by a stone balustrade to keep off the populace. Those who wish to peruse a more particular account of the Indian temples may consult Maurice's Indian Antiquities. See also PAGODA and SERINGHAM.

Crauford's Sketches, vol. i. p. 106.

* *Voyage des Indes*, tom. iii.

TEMPLE, in *Architecture*. The ancient temples were distinguished, with regard to their construction, into various kinds; as, *Temple in antæ*, *Ædes in antis*. These, according to Vitruvius, were the most simple of all temples, having only angular pilasters, called *antæ* or *parastatæ*, at the corners, and two Tuscan columns on each side of the doors. *Temple tetrastyle*, or simple *tetrastyle*, was a temple that had four columns in front, and as many behind. Such was the temple of Fortuna Virilis at Rome. *Temple prostyle*, that which had only columns in its front or foreside; as that of Ceres at Eleusis in Greece. *Temple amphiprostyle*, or *double prostyle*, that which had columns both before and behind, and which was also tetrastyle. *Temple, periptere*, that which had four rows of insulated columns around, and was hexastyle, i. e. had six columns in front; as the temple of Honour at Rome. *Temple diptere*, that which had two wings and two rows of columns around, and was also octostyle, or had eight columns in front; as that of Diana at Ephesus.

TEMPLES, among us, denote two inns of court in London, thus called, because anciently the dwelling-house of the knight's templars. At the suppression of that order, they were purchased by the professors of the common law, and converted into *hospitia* or inns. They are called the *inner* and *middle temple*, in relation to Essex-house; which was also a part of the house of the templars, and called the *outer temple*, because situated without Temple-Bar. In the middle temple, during the time of the templars, the king's treasure was kept; as was also that of the kings of France in the house of the templars at Paris. The chief officer was the master of the temple, who was summoned to parliament in 47 Hen. III. and from him the chief minister of the temple-church is still called *master of the temple*.

TEMPLES, in *Anatomy*, a double part of the head, reaching from the forehead and eyes to the two ears. The temples are chiefly formed of two bones called *ossa temporis*. These parts, according to physicians, were called *tempora*, from their showing the age or time of a man by the colour of the hair, which turns white in this part before any other; which Homer seems to have been aware of, by his calling men *poliocrotaphi*, *q. d.* "grey-templed."

Temporal, Temporalities.

TEMPORAL, a term generally uſed for ſecular, as a diſtinction from eccleſiaſtical. Thus we ſay temporal lords, and ſpiritual or eccleſiaſtical lords.

TEMPORALITIES *of* BISHOPS, are the revenues, lands, tenements, and lay-fees, belonging to biſhops, as they are barons and lords of parliament.

The cuſtody of the temporalities of biſhops forms a branch of the king's ordinary revenues (ſee REVENUE. Theſe, upon the vacancy of the biſhopric, are immediately the right of the king, as a conſequence of his prerogative in church matters; whereby he is conſidered as the founder of all archbiſhoprics and biſhoprics, to whom, during the vacancy, they revert. And for the ſame reaſon, before the diſſolution of abbeys, the king had the cuſtody of the temporalities of all ſuch abbeys and priories as were of royal foundation (but not of thoſe founded by ſubjects), on the death of the abbot or prior. Another reaſon may alſo be given why the policy of the law hath veſted this cuſtody in the king; becauſe, as the ſucceſſor is not known, the lands and poſſeſſions of the ſee would be liable to ſpoil and devaſtation if no one had a property therein. Therefore the law has given the king, not the temporalities themſelves, but the cuſtody of the temporalities, till ſuch time as a ſucceſſor is appointed; with power of taking to himſelf all the intermediate profits, without giving any account to the ſucceſſor; and with the right of preſenting (which the crown very frequently exerciſes) to ſuch benefices and other preferments as fall within the time of vacation. This revenue is of ſo high a nature, that it could not be granted out to a ſubject, before or even after it accrued: but now, by the ſtatute 15 Edw. III. ſtat. 4. cap. 4 and 5. the king may, after the vacancy, leaſe the temporalities to the dean and chapter; ſaving to himſelf all advowſons, eſcheats, and the like. Our ancient kings, and particularly William Rufus, were not only remarkable for keeping the biſhoprics a long time vacant, for the ſake of enjoying the temporalities, but alſo committed horrible waſtes on the woods and other parts of the eſtate; and to crown all, would never, when the ſee was filled up, reſtore to the biſhop his temporalities again, unleſs he purchaſed them at an exorbitant price. To remedy which, King Henry I. granted a charter at the beginning of his reign, promiſing neither to ſell, nor let to farm, or take any thing from, the domains of the church, till the ſucceſſor was inſtalled. And it was made one of the articles of the great charter, that no waſte ſhould be committed in the temporalities of biſhoprics, neither ſhould the cuſtody of them be ſold. The ſame is ordained by the ſtatute of Weſtminſter the firſt; and the ſtatute 14 Edw. III. ſtat. 4. cap. 4. (which permits a leaſe to the dean and chapter) is ſtill more explicit in prohibiting the other exactions. It was alſo a frequent abuſe, that the king would, for trifling or no cauſes, ſeize the temporalities of biſhops, even during their lives, into his own hands: but this is guarded againſt by ſtatute 1 Edw. III. ſtat. 2. cap. 2.

Blackſt. Comment. vol. i.

This revenue of the king, which was formerly very conſiderable, is now by a cuſtomary indulgence almoſt reduced to nothing: for, at preſent, as ſoon as the new biſhop is conſecrated and confirmed, he uſually receives the reſtitution of his temporalities quite entire and untouched from the king; and then, and not ſooner, he has a fee-ſimple in his biſhopric, and may maintain an action for the profits.

Tenacity || Tenedos.

TENACITY, in *Natural Philoſophy*, that quality of bodies by which they ſuſtain a conſiderable preſſure or force of any kind without breaking. It is the quality oppoſite to fragility or brittleneſs. See *STRENGTH of Materials*.

TENACULUM, in *Surgery*, an inſtrument uſed in amputation, for pulling out bleeding veſſels that are to be tied by ligatures. See SURGERY.

TENAILLES and TENAILLIONS. See FORTIFICATION, Sect. I. § 3. and 5.

TENANT, one that holds lands or tenements of ſome lord or landlord, by rent, fealty, &c. See TENURE.

TENAWIT. See LOXIA, ORNITHOLOGY *Index*.

TENCH. See CYPRINUS, ICHTHYOLOGY *Index*.

TENDER, a ſmall ſhip in the ſervice of men of war, for carrying men, proviſions, or any thing elſe that is neceſſary.

TENDONS, in *Anatomy*, are white, firm, and tenacious parts, contiguous to the muſcles, and uſually forming their extremities. See ANATOMY, N° 85.

TENEBRIO, in *Natural Hiſtory*, a genus of inſects belonging to the order of coleoptera. See ENTOMOLOGY *Index*.

TENEDOS, in *Ancient Geography*, an iſland on the coaſt of Troas, at the diſtance of 40 ſtadia from the continent, and 80 in compaſs; with a cognominal Æolian town, and a temple of Apollo Smintheus. Its origin is derived from Tennes or Tenes, who being expoſed in a coffer or bog by his father Cygnus the Thracian, at the inſtigation of the mother-in-law, was by fate carried to this iſland, made king of it, and at length worſhipped as a god on account of his virtues. The iſland was famous for its earthen ware, for which purpoſe it had an excellent red clay; and hence Bochart would derive the appellation from *tinedom*, a "red clay." *Tenedia ſecuris*, is a proverbial ſaying to denote ſeverity; from a law there paſſed, that perſons found in the act of adultery ſhould be put to death; a ſeverity executed on the king's ſon; and therefore, in the coins of Tenedos, on one ſide are two heads in memorial of the king and his ſon, and on the reverſe an axe, (Ariſtotle). This iſland ſtill retains its ancient name; and is one of the ſmalleſt iſlands of the Archipelago, ſituated near the coaſt of Leſſer Aſia, weſt of the ruins of Troy. It is chiefly rocky, but fertile, being remarkable for producing the beſt Muſcadine wine in the Levant; and its poſition, thus near the mouth of the Helleſpont, has given it importance in all ages; veſſels bound toward Conſtantinople finding ſhelter in its port, or ſafe anchorage in the road, during the Eteſian or contrary winds, and in foul weather. The emperor Juſtinian erected a magazine to receive the cargoes of the corn ſhips from Alexandria, when detained there. This was a lofty building, 280 feet long and 90 broad. The voyage from Egypt was rendered leſs precarious, and the grain preſerved until it could be tranſported to the capital. Afterwards, during the troubles of the Greek empire, Tenedos experienced a variety of fortune. The pirates, who infeſted theſe ſeas, made it for many years their place of rendezvous; and Othman ſeized it in 1302, procured veſſels, and thence ſubdued the other iſlands of the Archipelago.

It

Tenedos, Teneriff.

It has continued in the poſſeſſion of the Turks ever ſince: and on the eaſtern ſide is a pretty large town, ſeated at the foot of a mountain, with a fine harbour commanded by a caſtle. E. Long. 27. 0. N. Lat. 29. 30.

TENERIFF, an iſland of Africa, and one of the Canaries, being the moſt conſiderable for riches, trade, and extent. It lies to the ſouth of the iſland of Salvages, to the weſt of the Grand Canary, to the north of the iſland of Gomera, and to the eaſt of that of Palma. It is of a triangular form, being about 45 miles in length and 20 in breadth; and in the centre is the famous *peak*, called by the natives *El Pico de Teyde*, which in clear weather may be ſeen at the diſtance of 120 miles, like a thin blue vapour very little darker than the ſky.

The moſt frequented harbour is called *Santa Cruz*, which is on the ſouth ſide of the iſland, and where ſhips with good anchors and cables may be ſafe in all weathers. At this port is the principal commercial town in the iſland, called alſo *Santa Cruz*, in the middle of which is a mole, built at a vaſt expence for the convenience of landing; between the mole and the town is a fort called *St Philip's*, and near it is a ſteep rocky den or valley, beginning at the ſea ſhore, and running far in land, which would render the attack of an enemy very difficult; there are alſo other forts for its defence, all joined together by a thick ſtone wall, and mounted with cannon.

Glas's Hiſtorical Account of the Canary Iſlands.

Santa Cruz is a large town, containing ſeveral churches and convents, an hoſpital, and the beſt conſtructed private buildings of any in the Canary iſlands. It contains about 7000 inhabitants; it is not fortified on the land ſide, and all the country near it is dry, ſtony, and barren.

About four leagues to the ſouth of Santa Cruz, cloſe to the ſea, there is a cave, with a chapel called the *chapel of our Lady of Candelaria*, in which is an image of the Virgin Mary, that is held in as much reverence here as that of Diana was at Epheſus. This chapel is endowed with ſo many ornaments that it is the richeſt place in all the ſeven iſlands. At a certain ſeaſon of the year almoſt all the inhabitants go thither on pilgrimage, and innumerable and incredible ſtories are related and univerſally believed concerning this image.

About four miles in land from Santa Cruz ſtands the city of St Chryſtobal de la Laguna, which is the metropolis of the iſland, and contains two pariſh churches and five convents, but has no trade, being inhabited principally by the gentry of the iſland; the inhabitants are numerous, yet nobody is ſeen in the ſtreets, which are ſolitary and deſolate, ſo that graſs grows in thoſe that are moſt frequented. There are many other towns in the iſland which contain a great number of people, but none are more than three leagues from the ſea.

All the fertile ground within a league of the ſea is covered with vines; that of the next league is ſown with corn, the third is adorned with woods, and above the woods are the clouds, for the iſland gradually aſcends from the ſea, riſing on all ſides till it terminates in the peak, which is the centre.

On the ſouth-eaſt of the iſland inland from *Candelaria* is a town called *Guimar*, where there are ſome families which know themſelves to be the genuine unmixed offſpring of the original natives; but they know nothing of the manners of their anceſtors, nor have they preſerved any remains of their language. They are fairer than the Spaniards of Andaluſia.

Teneriff.

Teneriff contains about 96,000 perſons, ſuppoſed to be equal to the number of inhabitants of all the reſt of the ſeven iſlands put together. The peaſants in general are wretchedly clothed; when they do appear better, they are habited in the Spaniſh faſhion. The men, in a genteeler line, dreſs very gayly, and are ſeldom ſeen without long ſwords. It is remarked, that few of them walk with dignity and eaſe; which may be attributed to the long cloaks they uſually wear. The women wear veils; thoſe worn by the lower ranks are of black ſtuff, thoſe of the higher of black ſilk; and ſuch among the latter as have any claim to beauty are far from being over careful in concealing their faces by them. The young ladies wear their fine long black hair plaited, and faſtened with a comb or a ribband on the top of the head.

White's Voyage to New South Wales, p. 18.

The common people, and in this they reſemble the inhabitants of moſt of the iſlands in the Pacific ocean lately diſcovered, have in them a ſtrong tendency to thieving; they are beſides lazy, and the moſt importunate beggars in the world. "I obſerved likewiſe (ſays Mr White) that the itch was ſo common among them, and had attained ſuch a degree of virulence, that one would almoſt be led to believe it was epidemic there. Some of the women are ſo abandoned and ſhameleſs, that it would be doing an injuſtice to the proſtitutes met with in the ſtreets of London to ſay they are like them. The females of every degree are ſaid to be of an amorous conſtitution, and addicted to intrigue; for which no houſes could be better adapted than thoſe in Teneriff.

"The manufactures carried on here are very few, and the product of them little more than ſufficient for their own conſumption. They conſiſt of taffeties, gauze, coarſe linens, blankets, a little ſilk, and curious garters. The principal dependence of the inhabitants is on their wine (their ſtaple commodity), oil, corn, and every kind of ſtock for ſhipping. With theſe the iſland abounds: and, in their ſeaſon, produces not only the tropical fruits, but the vegetable productions of the European gardens, in the greateſt plenty. Teneriff enjoys an agreeable and healthful mediocrity of climate. Indeed none ſeems better adapted for the reſtoration of a valetudinarian; as, by going into the mountains, he may graduate the air, and chooſe that ſtate of it which beſt ſuits his complaint. But although the inhabitants are thus healthy, and have ſo little occaſion for medical aid, they loudly complain of the want of knowledge in the profeſſional gentlemen of the iſland."

The height of the peak of Teneriff has been ſo variouſly eſtimated and calculated by different travellers and geographers, that we can only take the mean between the two extremes of their deciſions. Dr Halley allows but two miles and a quarter from the level of the ſea to the ſummit of the ſugar-loaf, whilſt the Spaniſh account of the Canary iſlands, tranſlated by Mr Glas in 1763, makes it no leſs than five miles; and others have aſſigned a height different from both theſe. That it is an extinguiſhed volcano is univerſally known.

Rye's Excurſion to the Peak of Teneriff.

"The crater of the peak of Teneriff (ſays Mongez) is a true ſulphur-pit, ſimilar to thoſe of Italy. It is about 50 fathoms long and 40 broad, riſing abruptly from

Teneriff || Teniers.

Journal de Physique.

from eaſt to weſt. At the edges of the crater, particularly on the under ſide, are many ſpiracles, or natural chimneys, from which there exhale aqueous vapours and ſulphureous acids, which are ſo hot as to make the thermometer riſe from 9° to 34° of Reaumur. The inſide of the crater is covered with yellow, red, or white, argillaceous earth, and blocks of lava partly decompoſed. Under theſe blocks are found ſuperb cryſtals of ſulphur; theſe are eight-ſided rhomboidal cryſtals, ſometimes an inch in length, and, I ſuppoſe, they are the fineſt cryſtals of volcanic ſulphur that have ever been found. The water that exhales from the ſpiracles is perfectly pure, and not in the leaſt acid, as I was convinced by ſeveral experiments. "The elevation of the peak above the level of the ſea is near 1900 toiſes." W. Long. 16. 18. N. Lat. 28. 29.

TENESMUS, in *Medicine*, is a continual deſire of going to ſtool, but without any ſtool being ready to be voided. See MEDICINE, N° 111.

TENIERS, DAVID, the Elder, a Flemiſh painter, born at Antwerp in 1582. He received the firſt rudiments of his art from the famous Rubens, who highly eſteemed him for his promiſing genius, and with great ſatisfaction examined and commended his deſigns. From the ſchool of that celebrated painter Teniers went to finiſh his ſtudies at Rome. He attached himſelf to Adam Elſheimer for ſix years; and from the inſtructions of two ſuch incomparable maſters, he formed to himſelf a peculiar ſtyle, which his ſon cultivated ſo happily afterward as to bring it to the utmoſt perfection. His pictures were ſmall; and his ſubjects uſually ſhops, elaboratories, humorous converſations, and rural feſtivities. The demand for his pieces was univerſal; and even his maſter Rubens thought them an ornament to his cabinet. He died at Antwerp in 1640.

TENIERS, *David*, the Younger, alſo an admirable painter, was the ſon of the former, and was born at Antwerp in 1610. He obtained the name of *Ape of Painting*, from his imitating the manner of different painters with ſuch exactneſs as to deceive even the niceſt judges. He improved greatly under his father, and obtained ſuch reputation as introduced him to the favour of the great. The archduke Leopold William made him gentleman of his bedchamber; and all the pictures of his gallery were copied by Teniers, and engraved by his direction. The king of Spain and Don Juan of Auſtria ſet ſo high a value on his pictures, that they built a gallery on purpoſe for them. William prince of Orange honoured him with his friendſhip; and Rubens not only eſteemed his works, but aſſiſted him with his advice. His principal talent lay in landſcapes, adorned with ſmall figures. He alſo painted men drinking and ſmoking, chemiſts elaboratories, country fairs, and the like. His ſmall figures are ſuperior to his large ones. He died in 1694.

The works of the father and ſon are thus diſtinguiſhed: The latter diſcover a finer touch and freſher pencil, greater variety of attitudes, and a better diſpoſition of the figures. The father retained ſomething of the tone of Italy in his colouring, which was ſtronger than the ſon's; beſides, the ſon uſed to put at the bottom of his pictures, David Teniers, junior.

Abraham, another ſon of David the Elder, was equal, if not ſuperior, to his father and brother in the expreſſion of his characters, and his underſtanding the *claro obſcuro*; though he was inferior in the ſprightlineſs of his touch, and the lightneſs of his pencil.

Teniſon, Tennis.

TENISON, DR THOMAS, archbiſhop of Canterbury, was born at Cottenham in Cambridgeſhire in 1636; and ſtudied at Corpus Chriſti college in Cambridge. In his youth, while the fanatical government laſted, he applied himſelf to phyſic; but afterward went into orders, and was ſome time miniſter of St Andrew's church, Cambridge; where he attended the ſick during the plague in 1665, which his pariſhioners acknowledged by the preſent of a piece of plate. He ſhowed himſelf very active againſt the growth of Popery by his writings both in King Charles and in King James's reigns: in 1680 he was preſented to the vicarage of St Martin's in the Fields, London, to which pariſh he made ſeveral donations; and among others, endowed a free ſchool, and built a handſome library, which he furniſhed with uſeful books. King William and Queen Mary, in 1689, preſented him to the archdeaconry of London; in 1691, he was nominated to the ſee of Lincoln, and in 1694 he ſucceeded Dr Tillotſon as archbiſhop of Canterbury. He performed all the duties of a good primate for 20 years, and died in 1715.

TENNIS, a play at which a ball is driven by a racket.

Hoyle's Games improved by Beaufort.

As many perſons would become players at tennis, provided they could eaſily underſtand the rudiments of the game, ſo as to form ſome judgement of the players, or at leaſt to know who wins and who loſes, we have here attempted to give ſo plain a deſcription of it, that no one can be at a loſs, if ever he ſhould bett or play. As to the executive part, it requires great practice to make a good player, ſo that nothing can be done without it; all we preſume to do is to give an inſight into the game, whereby a perſon may not ſeem a total ſtranger to it when he happens to be in a tennis court.

The game of tennis is played in moſt capital cities in Europe, particularly in France, from whence we may venture to derive its origin. It is eſteemed with many to be one of the moſt ancient games in Chriſtendom, and long before King Charles I.'s time it was played in England.

This game is as intricate as any game whatever; a perſon who is totally ignorant of it may look on for a month together, without being able to make out how the game is decided. Therefore we ſhall begin by deſcribing the court in which it is played.

The ſize of a tennis court is generally about 96 or 97 feet by 33 or 34, there being no exact dimenſion aſcribed to its proportion, a foot more or leſs in length or width being of no conſequence. A line or net hangs exactly acroſs the middle, over which the ball muſt be ſtruck, either with a racket or board to make the ſtroke good. Upon the entrance of a tennis-court, there is a long gallery which goes to the dedans, that is, a kind of front gallery, where ſpectators uſually ſtand, into which, whenever a ball is ſtruck, it tells for a certain ſtroke. This long gallery is divided into different compartiments or galleries, each of which has its particular name, as follows; from the line towards the dedans are the *firſt gallery*, *door*, *ſecond gallery*, and the *laſt gallery*, which is called the *ſervice ſide*. From the dedans to the laſt gallery are the figures 1, 2, 3, 4, 5, 6, at a yard diſtance each, by which the chaces are marked, and is one of the moſt eſſential parts of the game, as will appear in the following deſcription.

Tennis.

On the other ſide of the line are alſo the *firſt gallery, door, ſecond gallery*, and *laſt gallery*; which is called the *hazard-ſide*. Every ball ſtruck into the laſt gallery on this ſide reckons for a certain ſtroke the ſame as the dedans. Between the ſecond and this laſt gallery are the figures 1, 2, to mark the chaces on the hazard-ſide. Over this long gallery, or theſe compartiments, is a covering, called the pent-houſe, on which they play the ball from the ſervice-ſide, in order to begin a ſet of tennis, from which it is called a *ſervice*. When they miſs putting the ball (ſo as to rebound from the pent-houſe) over a certain line on the ſervice-ſide, it is deemed a fault, two of which are reckoned for a ſtroke. If the ball rolls round the pent-houſe, on the oppoſite ſide of the court, ſo as to fall beyond a certain line deſcribed for that purpoſe, it is called *paſſe*, reckons for nothing on either ſide, and the player muſt ſerve again.

On the right-hand-ſide of the court from the dedans is what they call the *tambour*, a part of the wall which projects, and is ſo contrived in order to make a variety in the ſtroke, and render it more difficult to be returned by the adverſary; for when a ball ſtrikes the *tambour*, it varies its direction, and requires ſome extraordinary judgement to return it over the line. The laſt thing on the right hand ſide is called the *grill*, wherein if the ball is ſtruck, it is alſo 15, or a certain ſtroke.

The game of tennis is played by what they call *ſets*; a ſet of tennis conſiſts of ſix games: but if they play what is called an advantage-ſet, two above five games muſt be won on one ſide or the other ſucceſſively, in order to decide; or, if it comes to ſix games all, two games muſt ſtill be won on one ſide to conclude the ſet; ſo that an advantage-ſet may laſt a conſiderable time; for which kind of ſets the court is paid more than for any other.

We muſt now deſcribe the uſe of the chaces, and by what means theſe chaces decide or interfere ſo much in the game. When the player gives his ſervice at the beginning of a ſet, his adverſary is ſuppoſed to return the ball; and wherever it falls after the firſt rebound untouched, the chace is called accordingly; for example, if the ball falls at the figure 1, the chace is called at a yard, that is to ſay, at a yard from the dedans: this chace remains till a ſecond ſervice is given; and if the player on the ſervice ſide lets the ball go after his adverſary returns it, and if the ball falls on or between any of theſe figures or chaces, they muſt change ſides, there being two chaces; and he who then will be on the hazard ſide, muſt play to win the firſt chace; which if he wins by ſtriking the ball ſo as to fall, after its firſt rebound, nearer to the dedans than the figure 1, without his adverſary's being able to return it from its firſt hop, he wins a ſtroke, and then proceeds in like manner to win the ſecond chace, wherever it ſhould happen to be. If a ball falls on the line with the firſt gallery door, ſecond gallery, or laſt gallery, the chace is likewiſe called at ſuch or ſuch a place, naming the gallery, door, &c. When it is juſt put over the line, it is called a chace at the line. If the player on the ſervice-ſide returns a ball with ſuch force as to ſtrike the wall on the hazard-ſide ſo as to rebound, after the firſt hop over the line, it is alſo called a chace at the line.

The chaces on the hazard-ſide proceed from the ball being returned either too hard or not quite hard enough; ſo that the ball after its firſt rebound falls on this ſide of the blue line, or line which deſcribes the hazard-ſide chaces; in which caſe it is a chace at 1, 2, &c. provided there is no chace depending. When they change ſides, the player, in order to win this chace, muſt put the ball over the line anywhere, ſo that his adverſary does not return it. When there is no chace on the hazard-ſide, all balls put over the line from the ſervice ſide, without being returned, reckon for a ſtroke.

As the game depends chiefly upon the marking, it will be neceſſary to explain it, and to recommend thoſe who play at tennis to have a good and unbiaſſed marker, for on him the whole ſet may depend: he can mark in favour of the one and againſt the other in ſuch a manner, as will render it two to one at ſtarting, though even players. Inſtead of which the marker ſhould be very attentive to the chaces, and not be anyway partial to either of the players.

This game is marked in a very ſingular manner, which makes it at firſt ſomewhat difficult to underſtand. The firſt ſtroke is called 15, the ſecond 30, the third 40, and the fourth game, unleſs the players get four ſtrokes each; in that caſe, inſtead of calling it 40 all, it is called *deuce*; after which, as ſoon as any ſtroke is got, it is called *advantage*; and in caſe the ſtrokes become equal again, *deuce* again, till one or the other gets two ſtrokes following, which win the game; and as the games are won, ſo they are marked and called; as one game love, two games to one, &c. towards the ſet, of which ſo many of theſe games it conſiſts.

Although but one ball at a time is played with, a number of balls are made uſe of at this game to avoid trouble, and are handed to the players in baſkets for that purpoſe: by which means they can play as long as they pleaſe, without ever having occaſion to ſtoop for a ball.

As to the odds at tennis, they are by no means fixed, but are generally laid as follow:

Upon the firſt ſtroke being won between even players, that is, fifteen love, the odds are of the

Single game	7 to	4
Thirty love	4	1
Forty love	8	1
Thirty fifteen	2	1
Forty fifteen	5	1
Forty thirty	3	1
The odds of a four game ſet when the firſt game is won, are	7	4
When two games love	4	1
Three games love	8	1
When two games to one	2	1
Three games to one	5	1
The odds of a ſix game ſet when the firſt game is won, are	3	2
When two games love	2	1
Three games love	4	1
Four games love	10	1
Five games love	21	1
When two games to one	8	5
Three games to one	5	2
Four games to one	5	1
Five games to one	15	1
When three games to two	7	4
Four games to two	4	1
Five games to two	10	1
When four games to three	2	1

Five

Tennis.

Five games to three - -	5	1
The odds of an advantage set when the first game is won, are -	5	4
When two games love -	7	4
Three games love - -	3	1
Four games love - -	5	1
Five games love - -	15	1
When two games to one -	4	3
Three games to one - -	2	1
Four games to one - -	7	2
Five games to one - -	10	1
When three games to two -	3	2
Four games to two - -	3	1
Five games to two - -	8	1
When four games to three -	8	5
Five games to three - -	3	1
When five games to four - -	2	1
When six games to five - -	5	2

The foregoing odds, as beforesaid, are generally laid, but the chaces interfering makes the odds very precarious; for example, when there is a chace at half a yard, and a set is five games all, and in every other respect equal, the odds are a good five to four; and if it were six games to five, and forty thirty with the same chace, the odds then would be a guinea to a shilling; so that it is plain that the odds at this game differ from those of any other: for one stroke will reduce a set, supposing the players to be five games all, from an even wager to three to two, and so on in proportion to the stage of the set.

There are various methods of giving odds at tennis, in order to make a match equal; and that they may be understood, we shall give the following list of them, with their meanings, so that any person may form a judgement of the advantage received or given.

The lowest odds that can be given, excepting the choice of the sides, is what they call a *bisque*, that is, a stroke to be taken or scored whenever the player, who receives the advantage, thinks proper: for instance, suppose a critical game of the set to be forty thirty, by taking the *bisque*, he who is forty becomes game, and so in respect of two *bisques*, &c.

The next greater odds are *fifteen*, that is, a certain stroke given at the beginning of each game.

After these, *half thirty*, that is, fifteen one game, and thirty the next. Then follow the whole *thirty*, *forty*, &c.

There are also the following kind of odds which are given, viz.

Round services; those are services given round the pent-house, so as to render it easy for the *striker-out* (the player who is on the hazard side) to return the ball.

Half-court, that is, being obliged or confined to play into the adversary's half-court; sometimes it is played straightwise, and at other times across; both which are great advantages given by him so confined, but the strait half-court is the greatest.

Touch-no-wall, that is, being obliged to play within the compass of the walls, or sides of the court. This is a considerable advantage to him who receives it; as all the balls must be played gently, and consequently they are much easier to take than those which are played hard, or according to the usual method of play.

Barring the hazards, that is, barring the dedans, tambour, grill, or the last gallery on the hazard-side, or any particular one or more of them.

Tennis || Tenter.

These are the common kind of odds or advantages given; but there are many others, which are according to what is agreed by the players: such as playing with *board* against *racket*, *cricket-bat* against *racket*, &c.

The game of tennis is also played by four persons, two partners on each side. In this case, they are generally confined to their particular quarters, and one of each side appointed to serve and strike out; in every other respect, the game is played in the same manner as when two only play.

Any thing more to be said upon this subject would be needless, as nothing can be recommended after reading this short account of tennis, but practice and attention, without which no one can become a proficient at the game.

TENOR, or TENOUR, the purport or content of a writing or instrument in law, &c.

TENOR, in *Music*, the first mean, or middle part, or that which is the ordinary pitch of the voice, when neither raised to a treble nor lowered to a bass.

TENSE, in *Grammar*, an inflection of verbs, whereby they are made to signify or distinguish the circumstance of time in what they affirm. See GRAMMAR.

TENT, in *War*, a pavilion or portable house. Tents are made of canvas, for officers and soldiers to lie under when in the field. The size of the officers tents is not fixed; some regiments have them of one size and some of another; a captain's tent and marquee is generally 10½ feet broad, 14 deep, and 8 high: the subalterns are a foot less; the major's and lieutenant-colonel's a foot larger; and the colonel's two feet larger. The subalterns of foot lie two in a tent, and those of horse but one. The tents of private men are 6½ feet square, and 5 feet high, and hold five soldiers each. The tents for horse are 7 feet broad and 9 feet deep: they hold likewise five men and their horse accoutrements.—The word is formed from the Latin *tentorium*, of *tendo* "I stretch," because tents are usually made of canvas stretched out, and sustained by poles, with cords and pegs.

TENT, in *Surgery*, a roll of lint made into the shape a nail with a broad flat head, chiefly used in deep wounds and ulcers. They are of service, not only in conveying medicines to the most intimate recesses and sinuses of the wound, but to prevent the lips of the wound from uniting before it is healed from the bottom; and by their assistance grumous blood, sordes, &c. are readily evacuated.

TENTER, TRIER, or *Prover*, a machine used in the cloth manufactory, to stretch out the pieces of cloth, stuff, &c. or only to make them even and set them square.

It is usually about 4½ feet high, and for length exceeds that of the longest piece of cloth. It consists of several long square pieces of wood, placed like those which form the barriers of a manege; so, however, as that the lower cross pieces of wood may be raised or lowered as is found requisite, to be fixed at any height by means of pins. Along the cross pieces, both the upper and the under one, are hooked nails, called *tenter-hooks*, driven in from space to space.

To put a piece of Cloth on the TENTER. While the piece is yet quite wet, one end is fastened to one of the

ends of the tenter; then it is pulled by force of arms towards the other end, to bring it to the length required: that other end being faſtened, the upper liſt is hooked on to the upper croſs-piece, and the loweſt liſt to the loweſt croſs-piece, which is afterwards lowered by force, till the piece have its deſired breadth. Being thus well ſtretched, both as to length and breadth, they bruſh it with a ſtiff hair bruſh, and thus let it dry. Then they take it off; and, till they wet it again, it will retain the length and breadth the tenter gave it.

TENTHREDO, the SAW-FLY; a genus of inſects belonging to the order of *hymenoptera*. See ENTOMOLOGY *Index*.

TENTHS, and *FIRST FRUITS of Spiritual Preferments*, a branch of the king's revenue. See REVENUE.

Theſe were originally a part of the Papal uſurpations over the clergy of this kingdom; firſt introduced by Pandulph the pope's legate, during the reigns of King John and Henry III. in the ſee of Norwich; and afterwards attempted to be made univerſal by the popes Clement V. and John XXII. about the beginning of the 14th century. The firſt fruits, *primitiæ* or *annates*, were the firſt year's whole profits of the ſpiritual preferment, according to a rate or *valor* made under the direction of Pope Innocent IV. by Walter biſhop of Norwich in 38 Hen. III. and afterwards advanced in value by commiſſion from Pope Nicholas III. A. D. 1292, 20 Edw. I.; which valuation of Pope Nicholas is ſtill preſerved in the exchequer. The tenths, or *decimæ*, were the tenth part of the annual profit of each living by the ſame valuation; which was alſo claimed by the holy ſee, under no better pretence than a ſtrange miſapplication of that precept of the Levitical law, which directs, that the Levites "ſhould offer the tenth part of their tithes as a heave offering to the Lord, and give it to Aaron the highprieſt." But this claim of the pope met with vigorous reſiſtance from the Engliſh parliament; and a variety of acts were paſſed to prevent and reſtrain it, particularly the ſtatute 6 Hen. IV. c. 1. which calls it a *horrible miſchief and damnable cuſtom*. But the Popiſh clergy, blindly devoted to the will of a foreign maſter, ſtill kept it on foot; ſometimes more ſecretly, ſometimes more openly and avowedly: ſo that in the reign of Henry VIII. it was computed, that in the compaſs of 50 years 800,000 ducats had been ſent to Rome for firſt fruits only. And as the clergy expreſſed this willingneſs to contribute ſo much of their income to the head of the church, it was thought proper (when in the ſame reign the papal power was aboliſhed, and the king was declared the head of the church of England) to annex this revenue to the crown; which was done by ſtatute 26 Hen. VIII. c. 3. (confirmed by ſtatute 1 Eliz. c. 4.); and a new *valor beneficiorum* was then made, by which the clergy are at preſent rated.

Blackſt. Comment. vol. i.

By theſe laſt mentioned ſtatutes all vicarages under ten pounds a year, and all rectories under ten marks, are diſcharged from the payment of firſt fruits: and if, in ſuch livings as continue chargeable with this payment, the incumbent lives but half a year, he ſhall pay only one quarter of his firſt fruits; if but one whole year, then half of them; if a year and a half, three quarters; and if two years, then the whole, and not otherwiſe. Likewiſe by the ſtatute 27 Hen VIII. c. 8. no tenths are to be paid for the firſt year, for then the firſt fruits are due: and by other ſtatutes of Queen Anne, in the fifth and ſixth years of her reign, if a benefice be under 50l. per annum clear yearly value, it ſhall be diſcharged of the payment of firſt fruits and tenths.

Thus the richer clergy being, by the criminal bigotry of their Popiſh predeceſſors, ſubjected at firſt to a foreign exaction, were afterwards, when that yoke was ſhaken off, liable to a like miſapplication of their revenues through the rapacious diſpoſition of the then reigning monarch; till at length the piety of Queen Anne reſtored to the church what had been thus indirectly taken from it. This ſhe did, not by remitting the tenths and firſt fruits entirely; but, in a ſpirit of the trueſt equity, by applying theſe ſuperfluities of the larger benefices to make up the deficiencies of the ſmaller. And to this end ſhe granted her royal charter, which was confirmed by the ſtatute 2 Ann. c. 11. whereby all the revenue of firſt fruits and tenths is veſted in truſtees for ever, to form a perpetual fund for the augmentation of poor livings. This is uſually called *Queen Anne's bounty*; which has been ſtill farther regulated by ſubſequent ſtatutes.

TENURE, in *Law*, ſignifies the manner whereby lands or tenements are held, or the ſervice that the tenant owes to his lord.

Of this kingdom almoſt all the real property is by the policy of our laws ſuppoſed to be granted by, dependent upon, and holden of, ſome ſuperior lord, by and in conſideration of certain ſervices to be rendered to the lord by the tenant or poſſeſſor of this property. The thing holden is therefore ſtyled a *tenement*, the poſſeſſors thereof *tenants*, and the manner of their poſſeſſion a *tenure*. Thus all the lands in the kingdom are ſuppoſed to be holden, mediately or immediately, of the king; who is ſtyled the *lord paramount*, or above all. Such tenants as held under the king immediately, when they granted out portions of the lands to inferior perſons, became alſo lords with reſpect to thoſe inferior perſons, as they were ſtill tenants with reſpect to the king; and, thus partaking of a middle nature, were called *meſne* or *middle lords*. So that if the king granted a manor to A, and he granted a portion of the land to B, now B was ſaid to hold of A, and A of the king; or, in other words, B held his lands immediately of A, but mediately of the king. The king therefore was ſtyled *lord paramount*: A was both tenant and lord, or was a meſne lord; and B was called *tenant paravail* or the *loweſt tenant*, being he who was ſuppoſed to make avail or profit of the land. In this manner are all the lands of the kingdom holden which are in the hands of ſubjects: for, according to Sir Edward Coke, in the law of England we have not properly *allodium*, which is the name by which the feudiſts abroad diſtinguiſh ſuch eſtates of the ſubject as are not holden of any ſuperior. So that at the firſt glance we may obſerve, that our lands are either plainly feuds, or partake very ſtrongly of the feodal nature.

Blackſt. Comment. vol. ii.

All tenures being thus derived, or ſuppoſed to be derived, from the king, thoſe that held immediately under him, in right of his crown and dignity, were called his *tenants in capite*, or *in chief*; which was the moſt honourable ſpecies of tenure, but at the ſame time ſubjected the tenants to greater and more burdenſome ſervices than inferior tenures did. And this diſtinction ran through all the different ſorts of tenure.

There ſeem to have ſubſiſted among our anceſtors four principal ſpecies of lay-tenures, to which all other may be reduced: the grand criteria of which were the natures of the

the ſeveral ſervices or renders that were due to the lords from their tenants. The ſervices, in reſpect of their quality, were either *free* or *baſe* ſervices: in reſpect of their quantity and the time of exacting them were either *certain* or *uncertain*. Free ſervices were ſuch as were not unbecoming the character of a ſoldier or a freeman to perform; as to ſerve under his lord in the wars, to pay a ſum of money, and the like. Baſe ſervices were ſuch as were fit only for peaſants or perſons of a ſervile rank; as to plough the lord's land, to make his hedges, to carry out his dung, or other mean employments. The certain ſervices, whether free or baſe, were ſuch as were ſtinted in quantity, and could not be exceeded on any pretence; as, to pay a ſtated annual-rent, or to plough ſuch a field for three days. The uncertain depended upon unknown contingencies; as, to do military ſervice in perſon, or pay an aſſeſſment in lieu of it when called upon; or to wind a horn upon the appearance of invaders: which are free ſervices; or to do whatever the lord ſhould command; which is a baſe or villein ſervice.

From the various combinations of theſe ſervices have ariſen the four kinds of lay-tenure which ſubſiſted in England till the middle of the laſt century; and three of which ſubſiſt to this day. Of theſe Bracton (who wrote under Henry III.) ſeems to give the cleareſt and moſt compendious account of any author ancient or modern; of which the following is the outline or abſtract: "Tenements are of two kinds, *frank-tenement*, and *villenage*. And of frank-tenements, ſome are held freely in conſideration of homage and knight-ſervice; others in free-ſocage, with the ſervice of fealty only. And again, of villenages, ſome are *pure*, and others *privileged*. He that holds in pure villenage ſhall do whatſoever is commanded him, and always be bound to an uncertain ſervice. The other kind of villenage is called *villein-ſocage*; and theſe villein-ſocmen do villein ſervices, but ſuch as are certain and determined." Of which the ſenſe ſeems to be as follows; firſt, where the ſervice was free, but uncertain, as military ſervice with homage, that tenure was called the *tenure in chivalry*, *per ſervitium militare*, or by knight-ſervice. Secondly, where the ſervice was not only free, but alſo certain, as by fealty only, by rent and fealty, &c. that tenure was called *liberum ſocagium*, or *free ſocage*. Theſe were the only free holdings or tenements; the others were villenous or ſervile: as, thirdly, where the ſervice was baſe in its nature, and uncertain as to time and quantity, the tenure was *purum villenagium*, abſolute or pure villenage. Laſtly, where the ſervice was baſe in its nature, but reduced to a certainty, this was ſtill villenage, but diſtinguiſhed from the other by the name of *privileged villenage*, *villenagium privilegiatum*; or it might be ſtill called *ſocage* (from the certainty of its ſervices), but degraded by their baſeneſs into the inferior title of *villanum ſocagium*, villein-ſocage.

1. The military tenure, or that by knight-ſervice, was done away by ſtat. 12 Car. II. For an account of this ſpecies of tenure ſee *FEODAL System*, and *KNIGHT-Service*; and for its incidents, ſee RELIEF, PRIMER-SEISIN, WARDSHIP, MARRIAGE, FINES, and ESCHEAT.

2. The ſecond ſpecies of tenure or free-ſocage, not only ſubſiſts to this day, but has in a manner abſorbed and ſwallowed up (ſince the ſtatute of Charles the Second) almoſt every other ſpecies of tenure. See SOCAGE.

The other grand diviſion of tenure, mentioned by Bracton, is that of villenage, as contradiſtinguiſhed from *liberum tenementum*, or frank-tenure. And this (we may remember) he ſubdivides into two claſſes, pure and privileged villenage: from whence have ariſen two other ſpecies of our modern tenures.

3. From the tenure of pure villenage have ſprung our preſent copyhold-tenures, or tenure by copy of court-roll at the will of the lord; in order to obtain a clear idea of which, it will be previouſly neceſſary to conſult the articles MANOR and VILLENAGE.

As a farther conſequence of what has been there explained, we may collect theſe two main principles, which are held to be the ſupporters of a copyhold-tenure, and without which it cannot exiſt: 1. That the lands be parcel of and ſituate within that manor under which it is held. 2. That they have been demiſed, or demiſable, by copy of court roll immemorially. For immemorial cuſtom is the life of all tenures by copy; ſo that no new copyhold can, ſtrictly ſpeaking, be granted at this day.

In ſome manors, where the cuſtom hath been to permit the heir to ſucceed the anceſtor in his tenure, the eſtates are ſtyled *copyholds of inheritance*; in others, where the lords have been more vigilant to maintain their rights, they remain copyholds for life only; for the cuſtom of the manor has in both caſes ſo far ſuperſeded the will of the lord, that, provided the ſervices be performed or ſtipulated for by fealty, he cannot in the firſt inſtance refuſe to admit the heir of his tenant upon his death; nor, in the ſecond, can he remove his preſent tenant ſo long as he lives, though he holds nominally by the precarious tenure of his lord's will.

The fruits and appendages of a copyhold-tenure, that it hath in common with free tenures, are fealty, ſervices (as well in rents as otherwiſe), reliefs, and eſcheats. The two latter belong only to copyholds of inheritance; the former to thoſe for life alſo. But, beſides theſe, copyholds have alſo heriots, wardſhip, and fines. Heriots, which are agreed to be a Daniſh cuſtom, are a render of the beſt beaſt or other good (as the cuſtom may be) to the lord on the death of the tenant. This is plainly a relic of villein tenure; there being originally leſs hardſhip in it, when all the goods and chattels belonged to the lord, and he might have ſeized them even in the villein's lifetime. Theſe are incident to both ſpecies of copyhold; but wardſhip and fines to thoſe of inheritance only. Wardſhip, in copyhold-eſtates, partakes both of that in chivalry and that in ſocage. Like that in chivalry, the lord is the legal guardian, who uſually aſſigns ſome relation of the infant tenant to act in his ſtead: and he, like guardian in ſocage, is accountable to his ward for the profits. Of fines, ſome are in the nature of primer-ſeiſins, due on the death of each tenant, others are mere fines for alienations of the lands; in ſome manors, only one of thoſe ſorts can be demanded, in ſome both, and in others neither. They are ſometimes arbitrary and at the will of the lord, ſometimes fixed by cuſtom; but, even when arbitrary, the courts of law, in favour of the liberty of copyholders, have tied them down to be reaſonable in their extent; otherwiſe they might amount to diſherition

of

Tenure.

of the eſtate. No fine therefore is allowed to be taken upon deſcents and alienations (unleſs in particular circumſtances) of more than two years improved values of the eſtate. From this inſtance we may judge of the favourable diſpoſition that the law of England (which is a law of liberty) hath always ſhown to this ſpecies of tenants, by removing, as far as poſſible, every real badge of ſlavery from them, however ſome nominal ones may continue. It ſuffered cuſtom very early to get the better of the expreſs terms upon which they held their lands; by declaring, that the will of the lord was to be interpreted by the cuſtom of the manor; and, where no cuſtom has been ſuffered to grow up to the prejudice of the lord, as in this caſe of arbitrary fines, the law itſelf interpoſes in an equitable method, and will not ſuffer the lord to extend his power ſo far as to diſinherit the tenant.

4. There is yet a fourth ſpecies of tenure, deſcribed by Bracton, under the name ſometimes of *privileged villenage*, and ſometimes of *villein-ſocage*. See *Privileged* VILLENAGE.

Having in the preſent article and thoſe referred to, taken a compendious view of the principal and fundamental points of the doctrine of tenures, both ancient and modern, we cannot but remark the mutual connection and dependence that all of them have upon each other. And upon the whole it appears, that, whatever changes and alterations theſe tenures have in proceſs of time undergone, from the Saxon era to the 12 Car. II. all lay-tenures are now in effect reduced to two ſpecies; free tenure in common ſocage, and baſe tenure by copy of court-roll. But there is ſtill behind one other ſpecies of tenure, referred by the ſtatute of Charles II. which is of a ſpiritual nature, and called the tenure in *FRANK-Almoign*; ſee that article.

A particular account of the ancient tenures would to many perſons be highly amuſing. We can only ſelect a few of the moſt ſingular, referring the curious reader for more information to Anderſon's Origin of Commerce, Henry's Hiſtory of Britain, and Blount's *Fragmenta Antiquitates*.

In the 19th of Henry III. Walter Gately held the manor of Weſtcourt, in Bedington in Surry, yielding yearly to the king one croſs-bow, *baliſtam*, value twelve pence.

Anno tertio Edw. I. Oſbert de Lonchamp, knight, held his lands of Ovenhelle in Kent, for perſonally guarding the king forty days into Wales at his own expence, with one horſe of five ſhillings value, one ſack worth ſixpence, and one broch for that ſack. *N. B.* All perſonal ſervices, or attendances on our kings in thoſe times, were limited to forty days, at their own expence.

The like the ſame year of Laurence de Broke, who for his hamlet of Renham in Middleſex, found the king one ſoldier, a horſe worth five ſhillings, a ſack worth fivepence, and a broch worth twopence (this broch was a kind of cup, jug, pot, or baſon), for forty days, at his own expence, wherever his army ſhall be within the four ſeas. This was ſettled (ſays Mr Blount) at the Stone Croſs, which ſtood near the May-pole in the Strand, London, where the judges-itinerant uſed in old times to ſit.

Robert Maunſel's tenure of lands in Peverel paid the ſame ſervice, and the horſe, ſack, and broch, of the ſame prices.

13*mo* Edw. I. Henry de Averning's tenure of the manor of Morton in Eſſex, was to find a man, a horſe worth ten ſhillings, four horſe-ſhoes, a leather ſack, and an iron broch.

The year following, three perſons held thirty acres of land in Carleton in Norfolk, by the ſervice of bringing the king, whenever he ſhall be in England, twenty-four paſties of freſh herrings, at their firſt coming in.

Another held his manor in Norfolk of that king, by annually ſupplying him at his exchequer with two veſſels, called *mues*, of wine made of pearmains. "Here (ſays our author) it is worth obſerving, that in King Edward the Firſt's time pearmain cyder was called *wine*." This therefore ſeems to account for the mention of vineyards in old times in Kent, Suſſex, and other parts of England, which has ſo often puzzled many people to elucidate.

Another perſon, in the 21ſt of the ſaid king, held thirty acres of land, valued at ten ſhillings yearly in the exchequer, or fourpence per acre, in Cambridgeſhire, for furniſhing a truſs of hay for the king's neceſſary-houſe or privy, whenever he ſhall come into that county.

Another, in the 34th of that king, held a manor in Kent for providing a man to lead three greyhounds when the king ſhall go into Gaſcony, ſo long as a pair of ſhoes of fourpence ſhould laſt.

And that we may not again recur to theſe old tenures, we ſhall further add, from the ſame author, that in the firſt year of King Edward II. Peter Spileman made fine to the king for his lands by ſerjeanty, to find one to ſerve as a ſoldier for forty days in England, with a coat of mail; alſo to find ſtraw for the king's bed, and hay for his horſe.

This article of ſtraw for the king's bed we did not ſo much wonder at, when we found it in an article in William the Conqueror's time; but it is ſomewhat more remarkable ſo late as the days of King Edward II.

Several others, we find, held their lands of the crown in thoſe times by very different tenures. One, by paying two white capons annually; another, by carrying the king's ſtandard whenever he happens to be in the county of Suſſex; another, by carrying a rod or batoon before the king on certain occaſions; another, by ſerving the office of chamberlain of the exchequer, a very good place at preſent; another, by building and upholding a bridge; another, by being marechal (*meretricum*), i. e. as Mr Blount tranſlates it, of the laundreſſes in the king's army; another, by acting as a ſerjeant at arms for the king's army whilſt in England; one ſupplies a ſervant for the king's larder; another, for his wardrobe; others, to find ſervants for this or that foreſt; another, a hawk; one preſents the king a pair of ſcarlet hoſe annually; others are bound to ſupply ſoldiers with armour for certain days, for the keeping this or that caſtle; one, viz. for the manor of Elſton in Nottinghamſhire, pays yearly rent of one pound weight of cummin ſeed, two pair of gloves, and a ſteel needle; another, is to repair the iron-work of the king's ploughs; Ela counteſs of Warwick, in the 13th year of King Edward I. held the manor of Hokenorton in Oxfordſhire, in the barony of D'Oyly, by the ſerjeanty of

of carving at the king's table on his birth-day, and she to have the knife the king then uses at table.

TEOS, one of the twelve Ionian cities, was situated on the south side of the Ionian peninsula, and distinguished by being the place where the poet Anacreon and the historian Hecatæus were born.

TERAPHIM, or THERAPHIM, a word in the Hebrew language, which has exercised much the ingenuity of the critics. It occurs 13 or 14 times in the Old Testament, and is commonly interpreted *idols*. We will not trouble our readers with the numerous conjectures which have been formed respecting the meaning of this word. The only way to determine it, if it be at all possible, would be to examine and compare all the passages in which it occurs, and to consult the ancient translations. Conjectures are useless; every man may make a new one, which will have just as good a title to belief as those which have been already proposed.

TERCERY, or TERCERA, one of the largest islands of the Azores, or Western islands, lying in the Atlantic ocean. It is about 40 miles in circumference; and surrounded with craggy rocks, which render it almost inaccessible. The soil is fertile, abounding in corn, wine, and fruits; and they have plenty of cattle to supply the ships which call there. Their principal trade is wood. The inhabitants are lively, addicted to gallantry, and are said to be extremely revengeful. It is subject to Portugal; and Angra is the capital town. W. Long. 27. 1. N. Lat. 28. 45.

TEREBELLA, the PIERCER, a genus of insects belonging to the class of vermes, and order of mollusca. See HELMINTHOLOGY *Index*.

TEREBINTHUS. See PISTACIA, BOTANY *Index*.

TEREDO, a genus of vermes belonging to the order of testacea. See CONCHOLOGY *Index*.

TERENCE, or PUBLIUS TERENTIUS AFER, a celebrated comic poet of ancient Rome, was born at Carthage in Africa. He was slave to Terentius Lucanus the senator; who gave him his liberty on account of of his wit, his good mien, and great abilities. Terence, on his becoming a freed man, applied himself to the writing of comedies; in the execution of which he imitated Menander and the other celebrated comic poets of Greece. Cicero gives him the most pompous eulogiums, both for the purity of his language and the perspicuity and beauty of his compositions, which he considers as the rule and standard of the Latin tongue; and observes, that they were esteemed so fine and elegant, that they were thought to have been written by Scipio and Lelius, who were then the greatest personages and the most eloquent of the Roman people. Terence died while on a voyage into Greece, about the 15th year before the Christian era. There are six of his comedies extant, of which the best editions are the Elzevir one 1635, 12mo; that *cum integris notis Donati, et selectis variorum*, 1686, 8vo; Westerhovius's, in two vols 4to, 1726; and that of Bentley the same year, 4to. Madame Dacier has given a beautiful French version of this author; and a very good English translation was published in 4to, 1768, by Mr Colman.

TERM, in *Law*, is generally taken for a limitation of time or estate; as, a lease for term of life or years.

Term, however, is more particularly used for that time wherein our courts of justice are open; in opposition to which, the rest of the year is called *vacation*.

TERM, in *Grammar*, denotes some word or expression in a language.

The word *term*, *terminus*, is borrowed metaphorically, by the grammarians and philosophers, from the measurers or surveyors of lands: as a field is defined and distinguished by its *termini*, or limits, so is a thing or matter spoken of by the word or term it is denoted by.

TERM in the Arts, or *TERM of Art*, is a word which, besides the literal and popular meaning which it has or may have in common language, bears a further and peculiar meaning in some art or science.

TERMS, the several times or seasons of the year, wherein the tribunals, or courts of judicature, are open to all who think fit to complain of wrong, or to seek their rights by due course of law, or action; and during which the courts in Westminster-hall sit and give judgement. But the high court of parliament, the chancery, and inferior courts, do not observe the terms; only the courts of king's-bench, common-pleas, and exchequer, which are the highest courts at common law. In contradistinction to these, the rest of the year is called *vacation*.

Of these terms there are four in every year, during which time matters of justice are dispatched. *Hilary-term*, which, at London, begins the 23d day of January, or if that be Sunday, the next day after; and ends the 12th of February following. *Easter-term*, which begins the Wednesday fortnight after Easter-day, and ends the Monday next after Ascension-day. *Trinity-term*, beginning the Friday next after Trinity-Sunday, and ending the Wednesday fortnight after. *Michaelmas-term*, which begins the sixth day of November, and ends the 28th of November following. Each of these terms have also their returns. These terms are supposed by Mr Selden to have been instituted by William the Conqueror; but Sir H. Spelman hath shewn, that they were gradually formed from the canonical constitutions of the church; being no other than those leisure seasons of the year which were not occupied by the great festivals or fasts, or which were not liable to the general avocations of rural business. Throughout all Christendom, in very early times, the whole year was one continual term for hearing and deciding causes. For the Christian magistrates, in order to distinguish themselves from the heathens, who were very superstitious in the observation of their *dies fasti* and *nefasti*, administered justice upon all days alike; till at length the church interposed, and exempted certain holy seasons from being profaned by the tumult of forensic litigations; as, particularly, the time of Advent and Christmas, which gave rise to the winter vacation; the time of Lent and Easter, which created that in the spring; the time of Pentecost, which produced the third; and the long vacation, between midsummer and Michaelmas, which was allowed for the hay-time and harvest. All Sundays also, and some peculiar festivals, as the days of the purification, ascension, &c. were included in the same prohibition, which was established by a canon of the church, A. D. 517, and fortified by an imperial constitution of the younger Theodosius, comprized in the Theodosian code. Afterwards, when our own legal constitution was established, the commencement and duration of our law terms

terms were appointed, with a view to these canonical prohibitions; and it was ordered by the laws of King Edward the Confessor, that from Advent to the octave of the Epiphany, from Septuagesima to the octave of Easter, from the Ascension to the octave of Pentecost, and from three in the afternoon of all Saturdays till Monday morning, the peace of God and holy church shall be kept throughout the whole kingdom.

And so extravagant was afterwards the regard paid to these holy times, that though the author of the Mirror mentions only one vacation of considerable length, containing the months of August and September, yet Britton says, that in the reign of King Edward I. no secular plea could he held, nor any man sworn on the Evangelists, in the time of Advent, Lent, Pentecost, harvest, and vintage, the days of the great litanies, and all solemn festivals. He adds, that the bishops and prelates granted dispensations for taking assizes and juries in some of these holy seasons, upon reasonable occasions; and soon after a general dispensation was established in parliament by stat. Westm. 1. 3 Edw. I. cap. 51. that assizes of novel disseisin, *mort d'ancestor*, and darrein presentment, should be taken in Advent, Septuagesima, and Lent, as well as inquests; at the special request of the king to the bishops. The portions of time that were not included within these prohibited seasons fell naturally into a fourfold division; and from some festival, or saint's day, that immediately preceded their commencement, were denominated the terms of *St Hilary*, of *Easter*, of the *Holy Trinity*, and of *St Michael*: which terms have been since regulated and abbreviated by several acts of parliament; particularly Trinity-term by stat. 32 Hen. VIII. cap. 2. and Michaelmas-term by stat. 16 Car. I. cap. 6. and again by stat. 24 Geo. II. cap. 48.

TERMS, *Oxford*. Hilary or Lent-term begins January 14th, and ends the Saturday before Palm-Sunday. Easter-term begins the tenth day after Easter, and ends the Thursday before Whitsunday. Trinity-term begins the Wednesday after Trinity-Sunday, and ends after the act, or 6th of July, sooner or later, as the vice chancellor and convocation please. Michaelmas-term begins October the 10th, and ends December the 17th.

TERMS, *Cambridge*. Lent-term begins January the 14th, and ends Friday before Palm-Sunday. Easter-term begins the Wednesday after Easter-week, and ends the week before Whitsunday. Trinity-term begins the Wednesday after Trinity-Sunday, and ends the Friday after the commencement, or 2d of July. Michaelmas-term begins October the 10th, and ends December the 16th.

TERMS, *Scottish*. The court of session has two terms, the winter and summer. The winter begins on 12th November, and ends 11th March, only there is a recess of three weeks at Christmas. The summer term commences, 12th May, and ends 11th July. The court of exchequer has four terms: 1. Candlemas term begins 15th January, and ends 3d February; 2. Whitsuntide term beings 12th May, and ends 2d June; 3. Lammas term begins 17th June, and ends 5th July; 4. Martinmas term begins 24th November, and ends 20th December.

TERMS, *Irish*. In Ireland the terms are the same as at London, except Michaelmas term, which begins October the 13th, and adjourns to November the 3d, and thence to the 6th.

TERMES, a genus of insects belonging to the order of aptera. See ENTOMOLOGY *Index*.

TERMINALIA, in antiquity, feasts celebrated by the Romans in honour of the god Terminus.

TERMINALIA, a genus of plants belonging to the class polygamia. See BOTANY *Index*.

TERMINI, in *Architecture*, denote a kind of statues or columns, adorned on the top with the figure of a man's, woman's, or satyr's head, as a capital; and the lower part ending in a kind of sheath or scabbard.

TERMINUS, in Pagan worship, an ancient deity among the Romans, who presided over the stones or landmarks, called *termini*, which were held so sacred, that it was accounted sacrilege to move them; and as the criminal became devoted to the gods, it was lawful for any man to kill him. The worship of this deity was instituted by Numa Pompilius, who, to render landmarks, and consequently the property of the people, sacred, erected a temple on the Tarpeian mount to Terminus.

TERN. See STERNA, ORNITHOLOGY *Index*.

TERNATE, the most northerly of the Molucca or Clove islands in the East Indies. It abounds in cocoanuts, bananas, citrons, oranges, and other fruits peculiar to the torrid zone; but cloves are the most valuable produce. It is in the possession of the Dutch. Malaya is the capital town. E. Long. 129. 0. N. Lat. 1. 0.

TERNI, a town of Italy in the pope's territories, and in the duchy of Spoletto, with a bishop's see. It is but a small place; though there are very beautiful ruins of antiquity, it having been a very considerable Roman colony. It is situated on the top of a high mountain, and to the west of it are fields which are extremely fertile. E. Long. 12. 40. N. Lat. 42. 34.

TERNSTROMIA, a genus of plants belonging to the class polyandria. See BOTANY *Index*.

TERPANDER, a celebrated Greek poet and musician. The Oxford marbles tell us that he was the son of Derdeneus of Lesbos, and that he flourished in the 381st year of these records; which nearly answers to the 27th Olympiad, and 671st year B. C. The marbles inform us likewise, that he taught the *nomes*, or airs, of the lyre and flute, which he performed himself upon this last instrument, in concert with other players on the flute. Several writers tell us that he added three strings to the lyre, which before his time had but four; and in confirmation of this, Euclid and Strabo quote two verses, which they attribute to Terpander himself.

> The tetrachord's restraint we now despise,
> The seven-string'd lyre a nobler strain supplies.

Among the many signal services which Terpander is said to have done to music, none was of more importance than the notation that is ascribed to him for ascertaining and preserving melody, which before was traditional, and wholly dependent on memory. The invention, indeed, of musical characters has been attributed by Alypius and Gaudentius, two Greek writers on music, and upon their authority by Boethius, to Pythagoras, who flourished full two centuries after Terpander. But Plutarch, from Heraclides of Pontus, assures us that Terpander, the inventor of nomes for the cithara, in hexameter

hexameter verſe, ſet them to muſic, as well as the verſes of Homer, in order to ſing them at the public games: And Clemens Alexandrinus, in telling us that this muſician wrote the laws of Lycurgus in verſe, and ſet them to muſic, makes uſe of the ſame expreſſion as Plutarch; which ſeems clearly to imply a written melody.

After enumerating the airs which Terpander had compoſed and to which he had given names, Plutarch continues to ſpeak of his other compoſitions; among which he deſcribes the proems, or hymns for the cithara, in heroic verſe. Theſe were uſed in after-times by the rhapſodiſts, as prologues or introductions to the poems of Homer and other ancient writers. But Terpander rendered his name illuſtrious, no leſs by his performances upon the flute and cithara than by his compoſitions. This appears by the marbles already mentioned; by a paſſage in Athenæus, from Hellanicus, which informs us that he obtained the firſt prize in the muſical conteſts at the Carnean games; and by the teſtimony of Plutarch, who ſays, that "no other proof need be urged of the excellence of Terpander in the art of playing upon the cithara, than the regiſter of the Pythic games, from which it appears that he gained four prizes ſucceſſively at thoſe ſolemnities. Of the works of this poet only a few fragments now remain.

TERRA AUSTRALIS INCOGNITA, a name for a large unknown continent, ſuppoſed to lie towards the ſouth pole, and which for a long time was ſought after by navigators. The voyages of Captain Cook have aſcertained this matter as much as it probably ever will be. (See *SOUTH Sea; COOK's Diſcoveries*, N° 47, 48, 68, 69; and AMERICA, N° 4). On this ſubject Captain Cook expreſſes himſelf as follows: "I had now made the circuit of the Southern ocean in a high latitude, and traverſed it in ſuch a manner as to leave not the leaſt room for the poſſibility of there being a continent, unleſs near the pole, and out of the reach of navigation. By twice viſiting the tropical ſea, I had not only ſettled the ſituation of ſome old diſcoveries, but made there many new ones, and left, I conceive, very little more to be done even in that part. Thus I flatter myſelf, that the intention of the voyage has in every reſpect been fully anſwered; the ſouthern hemiſphere ſufficiently explored; and a final end put to the ſearching after a ſouthern continent, which has at times engroſſed the attention of ſome of the maritime powers for near two centuries paſt, and been a favourite theory amongſt the geographers of all ages. That there may be a continent, or large tract of land near the pole, I will not deny: on the contrary, I am of opinion there is; and it is probable that we have ſeen a part of it. The exceſſive cold, the many iſlands, and vaſt floats of ice, all tend to prove that there muſt be land to the ſouth; and for my perſuaſion that this ſouthern land muſt lie or extend fartheſt to the north, oppoſite to the ſouthern Atlantic and Indian oceans, I have already aſſigned ſome reaſons; to which I may add, the greater degree of cold experienced by us in theſe ſeas than in the Southern Pacific ocean under the ſame parallels of latitude."

TERRA Firma, in *Geography*, is ſometimes uſed for a continent, in contradiſtinction to iſlands.

TERRA Firma, otherwiſe called *New Caſtile*, or *Caſtella del Oro*, a country of America, bounded on the north by the North ſea and part of the Atlantic ocean, by the ſame ſea and Guiana on the eaſt, by the country of the Amazons and Peru on the ſouth, and by the Pacific ocean and Veragua on the weſt. It lies between 62 and 83 degrees of weſt longitude, and between the equator and 12 degrees of north latitude; being upwards of 1200 miles in length from eaſt to weſt, and 800 in breadth from north to ſouth. It had the name of *Caſtella del Oro* from the quantity of gold found in the diſtricts of Uraba and other parts; and was firſt diſcovered by the celebrated Columbus in his third voyage.

The climate is neither pleaſant nor healthy; the inhabitants one part of the year being ſcorched by the moſt intenſe and burning heat, and the other almoſt drowned with perpetual floods of rain, pouring from the ſky with ſuch violence as if a general deluge was to enſue.

In ſo large a tract of country the ſoil muſt neceſſarily vary. Accordingly, in ſome parts it is a barren ſand, or drowned mangrove land, that will ſcarce produce any kind of grain; in others it yields Indian corn, balms, gums, and drugs, almoſt all manner of fruits as well of Old as of New Spain, ſugar, tobacco, Braſil wood, and ſeveral other kinds of dyeing woods; a variety of precious ſtones, particularly emeralds and ſapphires; veniſon and other game. The plantations of cacao, or chocolate nuts, in the diſtrict of the Caraccas, are eſteemed the beſt in America. The mountains abound with tygers, and, according to ſome, with lions, and great numbers of other wild beaſts. The rivers, ſeas, and lakes, teem with fiſh, and alſo with alligators; and the bowels of the earth were once furniſhed with the richeſt treaſures, now almoſt exhauſted. The ſame may be ſaid of the pearl fiſheries on the coaſt, which are far from being ſo profitable now as formerly.

Terra Firma is a very mountainous country. Terra Firma Proper, in particular, conſiſts of prodigious high mountains, and deep valleys flooded more than half the year. The mountains in the provinces of Carthagena and St Martha, according to Dampier, are the higheſt in the world: being ſeen at ſea 200 miles off: from theſe runs a chain of hills of almoſt equal height, quite through South America, as far as the ſtraits of Magellan, called the *Cordilleras des Andes*. The province of Venezuela alſo, and diſtrict of the Caraccas, the moſt northerly parts of South America, are almoſt a continued chain of hills, ſeparated by ſmall valleys, pointing upon the coaſt of the North ſea. A chain of barren mountains, almoſt impaſſable, runs through the province of Popayan from north to ſouth, ſome whereof are volcanoes; but towards the ſhores of the Pacific ocean it is a low country, flooded great part of the year.

The principal rivers of Terra Firma are, the Darien, Chagtre, Santa Maria, Conception, Rio Grande or Magdalena, Maricaibo, and Oroonoko.

Terra Firma contains the provinces of Terra Firma Proper or Darien, of Carthagena, St Martha, Rio de la Hacha, Venezuela, Comana, New Andaluſia or Paria, New Granada, and Popayan.

Terra Firma Proper lies in the form of a creſcent, about the ſpacious bay of Panama, being the iſthmus which joins South and North America; and extending in length between the two ſeas 300 miles, but in breadth, where the iſthmus is narroweſt, only 60. Here are found gold mines, gold ſands, and fine pearls; and though the land is generally rough, there are ſome fruitful valleys, watered by rivers, brooks, and ſprings. The chief places are Panama and Porto Bello.

The inhabitants of Terra Firma have never been thoroughly ſubdued, and in all probability never will; as they

they are a brave and warlike people, have retreats inaccessible to Europeans, and bear an inveterate enmity to the Spaniards. See DARIEN.

TERRA Japonica, or *Catechu*, a drug which was formerly supposed to be an extract from the seeds of the areca catechu, is obtained from the mimosa catechu. See MATERIA MEDICA *Index*.

TERRA Puzzolana. See PUZZOLANA.

TERRÆ Filius, Son of the Earth, a student of the university of Oxford, formerly appointed in public acts to make satirical and jesting speeches against the members thereof, to tax them with any growing corruptions, &c.

TERRACE, a walk or bank of earth, raised in a garden or court to a due elevation for a prospect. The name is also given to the roofs of houses that are flat, and whereon we may walk.

TERRAQUEOUS, in *Geography*, a name given to our globe, because consisting of land and water.

TERRAS, or TARRAS, in *Mineralogy*, a species of argillaceous earth, differing little from puzzolana, but in being more compact and hard, porous and spongy. It is generally of a whitish yellow colour, and contains more heterogeneous particles, as spar, quartz, shoerl, &c. and something more calcareous earth; it effervesces with acids, is magnetic, and fusible *per se*. When pulverized, it serves as a cement, like puzzolana. It is found in Germany and Sweden.

Kirwan's Mineralogy.

A species of red earth has been found in the parish of St Elizabeth in Jamaica, which turns out to be an excellent substitute for terras or puzzolana earth, and may therefore be of great value to the inhabitants of the West Indies.

Society for Arts, &c. vol. v.

One measure of this earth, mixed with two of well slaked lime, and one of sand, forms a cement that answers extremely well for buildings in water, for it soon hardens and becomes like a stone.

TERRASON, ABBE JOHN, a French writer, born at Lyons in 1669. He distinguished himself in the dispute concerning Homer, between La Motte and Madame Dacier, by writing a *Dissertation contre l'Iliade*. He wrote a political and moral romance called *Sethos*, full of learning and philosophy; and another capital work of his is a French translation of Diodorus Siculus. He died in 1750.

TERRE *Verte*, in the colour-trade, the name of a green earth much used by painters, both singly for a good standing green, and in mixture with other colours. The name is French, and signifies "green earth."

It is an indurated clay, of a deep bluish green colour, and is found in the earth, not in continued strata or beds, as most of the other earths are, but in large flat masses of different sizes, imbedded in other strata; these break irregularly in the cutting, and the earth is generally brought out of the pit in lumps of different sizes. It is of a fine, regular, and even structure, and not very hard. It is of an even and glossy surface, very smooth to the touch, and in some degree resembling the morochthus or French chalk, but adhering firmly to the tongue. It does not stain the hand in touching it; but being drawn along a rough surface, it leaves an even white line, with a greenish cast.

It does not effervesce with acids, and burns to a dusky brown colour. It is dug in the island of Cyprus, and in many parts of France and Italy. That from the neighbourhood of Verona has been esteemed the best in the world; but of late there has been some dug in France that equals it. There is also an earth dug on Mendip Hills, in the sinking for coal, which, though wholly unobserved, is nearly, if not wholly, of equal value. When scraped, and the finer parts separated, it is ready to be made up with oil for the use of the painters, and makes the most true and lasting green of any simple body they use.

TERRESTRIAL, something partaking of the nature of earth, or belonging to the globe of earth; thus we say, the terrestrial globe, &c.

TERRIER, a small hound to hunt the fox or badger; so called because he creeps into the ground, as ferrets do into the coney-burrows, after the fox, &c.

TERRITORY, in *Geography*, denotes an extentor compass of land, within the bounds or belonging to the jurisdiction of any state, city, or other subdivision of a country.

TERROR. See FEAR and FRIGHT.

TERTIAN FEVER. See MEDICINE, n° 126.

TERTULLIAN, or QUINTUS SEPTIMUS FLORENS TERTULLIANUS, a celebrated priest of Carthage, was the son of a centurion in the militia, who served as proconsul of Africa. He was educated in the Pagan religion; but being convinced of its errors, embraced Christianity, and became a zealous defender of the faith. He married, it is thought, after his baptism. Afterwards he took orders, and went to Rome; where, during the persecution under the emperor Severus, he published his Apology for the Christians, which is, in its kind, a masterpiece of eloquence and learning; and at the beginning of the third century he embraced the sect of the Montanists. He lived to a very great age, and died under the reign of Antoninus Caracalla, about the year 216. Many of his works are still extant, in all of which he discovers a great knowledge of the Holy Scriptures, a lively imagination, a strong, elevated, and impetuous style, great eloquence and strength of reasoning; but is sometimes obscure. His Apology and Prescriptions are most esteemed. The best editions of his works are those of Rigault: especially that of Venice in 1746, folio. Pamelius and Alix, Mr Thomas, and the Sieur du Fossé, have written his life; and Rigault, M. de l'Aube Epine, Father Petau, and other learned men, have published notes on his works.

TERUNCIUS, in antiquity, a very small brass coin in use among the Romans.

The inconvenience of such very small pieces being soon found, the teruncius became disused, but its name is still retained in reckoning, and thus it became a money of account. The teruncius at first was a quarter of the as, or libra; hence, as the as contained twelve ounces, the teruncius contained three, whence the name, which is formed of the Latin *tres unciæ*. Teruncius was also used for the quarter of the denarius; so that when the denarius was at ten ases, the teruncius was worth two and a half; and when the denarius was risen to sixteen, the teruncius was worth four. See DENARIUS.

TESSELATED PAVEMENTS, those of rich mosaic work, made of curious square marbles, bricks, or tiles, called *tesselæ* from their resembling dice.

TESSERA, in Roman antiquity, denoted in its primary sense a cube or dye; so called from the Greek word τεσσαρα or τεσσερα, *four*; respect being had to its number

number of ſides, diſtinct from the two horizontal planes above and below. And it was thus diſtinguiſhed from the talus, which being round at each end, contained only four planes or faces on which it could ſtand; and therefore when thrown had no more than two ſide faces in view. Hence *ludere talis et ludere teſſeris*, are ſpoken of by Roman writers as two different games. The ſyllable TES occurs often in Roman inſcriptions. The word *teſſera* was applied to many other things, not ſo much from a ſimilitude in the figure, as from the relation they bore to ſome other thing of which they were the ſign or token; as the points on the upper plane of the dye denoted the good or ill ſucceſs of the caſt.

The *teſſera hoſpitalis* was either public or private. As to the former, we find among the inſcriptions publiſhed by Gruter inſtances of two municipal towns which put themſelves under the patronage of the Roman governor; and the reciprocal engagement between them, engraved on two copperplates, in the form of an oblong ſquare, with a pediment at the top, is called in both *teſſera hoſpitalis*. The deſign of it was to cultivate or maintain a laſting friendſhip between private perſons and their families; and gave a mutual claim to the contracting parties and their deſcendants of a reception and kind treatment at each other's houſes, as occaſion offered. For which end thoſe teſſeræ were ſo contrived as beſt to preſerve the memory of that tranſaction to poſterity. And one method of doing this was by dividing one of them lengthwiſe into two equal parts; upon each of which one of the parties wrote his name, and interchanged it with the other. From this cuſtom came the prevailing expreſſion *teſſeram hoſpitalem confringere*, applied to perſons who violated their engagements.

The *teſſeræ frumentariæ* were ſmall tallies given by the emperors to the populace at Rome, entitling them to the reception of a quantity of corn from the public at ſtated ſeaſons. The perſon who had the inſpection of theſe was called *teſſerarius*. They were made of wood and of ſtone.

There was another kind of teſſera which intitled perſons to a ſight of the public games and other diverſions, uſually made in the form of an oblong ſquare.

The *teſſera militaris* was a ſignal given by the general or chief commander of an army, as a direction to the ſoldiers for executing any duty or ſervice required of them. This, upon urgent occaſions, was only vocal; but, in ordinary caſes, it was written on a tablet, commonly made of wood. Beſide theſe civil and military teſſeræ, there are others which relate to religious affairs, and may be called *ſacred*.

TESSON, or TESTON. See TESTER.

TESSOUWA, a conſiderable town in Africa, ſituated eaſt of Mourzouk, the capital of the kingdom of Fezzan. Near this town a deep and rapid ſtream is ſaid to have exiſted, but was overwhelmed by the moving ſands ſo frequent in Africa.

TEST, a veſſel uſed in metallurgy for abſorbing the ſcoriæ of metallic bodies when melted. See CUPEL, under ORES. *Reduction of*.

TEST-ACT, in *Law*, is the ſtatute 25 Car. II. cap. 2. which directs all officers, civil and military, to take the oaths, and make the declaration againſt tranſubſtantiation, in the court of King's Bench, or Chancery, the next term, or at the next quarter-ſeſſions, or (by ſubſequent ſtatutes) within ſix months after their admiſſion; and alſo within the ſame time to receive the ſacrament of the Lord's Supper, according to the uſage of the church of England, in ſome public church, immediately after divine ſervice or ſermon, and to deliver into court a certificate thereof ſigned by the miniſter and church warden, and alſo to prove the ſame by two credible witneſſes, upon forfeiture of 500l. and diſability to hold the ſaid office.

The avowed object of this act was to exclude from places of truſt all members of the church of Rome; and hence the diſſenters of that age, if they did not ſupport the bill when paſſing through the two houſes of parliament, gave it no oppoſition. For this part of their conduct they have been often cenſured with ſeverity, as having betrayed their rights from reſentment to their enemies. But is this a fair ſtate of the caſe? Were any rights in reality betrayed? That the dread of a popiſh ſucceſſor and of popiſh influence was the immediate and urgent cauſe of paſſing the *teſt-act*, is indeed true; but that the legiſlature, when guarding againſt an impending evil, had not likewiſe a retroſpect to another from which they had ſo recently been delivered, is not ſo evident. If it be proper to ſupport an eſtabliſhed church as a branch of the conſtitution, and if the teſt-act be calculated to afford that ſupport to the church of England, it is probable that the deliberations of parliament were as much influenced by the dread of puritanic fury, and a renewal of the covenant, as by apprehenſions of a perſecution from a popiſh king and popiſh councils. That the members of the church eſtabliſhed by law in England had as much reaſon to dread the effects of power in the hands of Puritans as in the hands of Papiſts, no impartial man will controvert, who is not a ſtranger to that period of our national hiſtory; and that it was the duty of the legiſlature by every method in their power to provide for the ſecurity of the conſtitution againſt the machinations of both its enemies, will be admitted by all but ſuch as are in love with anarchy on the one hand, or with deſpotiſm on the other.

Many people, when they talk or write of the *teſt-act*, ſeem to think that it was framed in oppoſition to the *religious* opinions of the church of Rome; and finding the Proteſtant diſſenters, who abhor theſe opinions, deprived by it of their civil *rights*, they ſpeak with indignation of a law which confounds the innocent with the guilty. But all this proceeds from a palpable miſtake of the purpoſe of the teſt. As the legiſlature had no authority to make laws againſt *any opinions whatever*, on account of their being falſe in theology; ſo it is not to be ſuppoſed that, in their deliberations on the TEST-ACT, the members of that auguſt body took into their conſideration the comparative orthodoxy of the diſtinguiſhing tenets of the Catholics and Puritans. As a religious ſect they might eſteem the latter much more than the former; but if they found that both had combined with their theological doctrines opinions reſpecting civil and eccleſiaſtical government, inconſiſtent with the fundamental principles of the Engliſh conſtitution, they had an undoubted right to enact a law, by which none ſhould be admitted to offices, in the execution of which they could injure the conſtitution, without previouſly giving ſecurity that their adminiſtration ſhould ſupport it in all its branches. It had not then been doubted, nor is there reaſon to doubt yet, but that an eſtabliſhed religion is neceſſary, in conjunction with civil govern-

Teſt.

ment, to preſerve the peace of ſociety; and therefore in every well regulated ſtate an eſtabliſhed religion muſt be ſupported, not becauſe it is the duty of the civil magiſtrate to conduct his ſubjects to future happineſs, but becauſe he cannot without ſuch an eſtabliſhment preſerve among them preſent tranquillity. The eſtabliſhment which muſt beſt anſwer this purpoſe, is that which, teaching the great and unchangeable duties of morality, is moſt acceptable in its government and forms of worſhip to the majority of the people; and therefore in giving a legal eſtabliſhment to one conſtitution of the church in preference to all others, it is only this circumſtance, and not the comparative purity of the rival churches, viewed merely as eccleſiaſtical corporations, to which it is the buſineſs of the legiſlature to pay attention. At the time when the *teſt-act* paſſed the two houſes of parliament, the eſtabliſhed church of England was certainly more acceptable to the great body of the people and to all ranks in the ſtate, than any one of the ſects, whether Catholic or Proteſtant, which diſſented from her; and therefore it was the duty of the legiſlature to preſerve to that church all her privileges and immunities, and to prevent thoſe hoſtile ſectaries from doing her injury in the diſcharge of any civil office with which they might be entruſted. It was with this view that the *teſt-act* was formed; and it is with the ſame view that the legiſlature has hitherto rejected every petition for its repeal. In doing ſo, it deprives no man of his *rights*, far leſs of rights which *conſcience* calls upon him to maintain at every hazard; for the rights of individuals to hold civil offices are not inherent, but derived from the legiſlature, which of courſe muſt be the judge upon what terms they are to be held. The legiſlature of England has excluded from many offices, civil and military, every man who will not give ſecurity, that in the diſcharge of his public duty he will ſupport the church eſtabliſhed by law; and as the teſt of his intention it requires him, before he enters upon his office, to renounce the doctrine of tranſubſtantiation, and receive the ſacrament of the Lord's Supper in ſome public church, according to the liturgy of the church of England. Whether this be the moſt proper teſt that could have been enacted, may well be queſtioned; but that in a country abounding with ſectaries of various denominations, who agree in nothing but venomous hoſtility to the religious eſtabliſhment, *ſome* teſt is neceſſary, ſeems incontrovertible, if it be the buſineſs of the legiſlature to preſerve the public peace.

To this it will be replied, That the public peace in Scotland is preſerved without a teſt, and that therefore a teſt cannot be neceſſary in England. This is plauſible, but not concluſive. For 40 years after the Revolution, there was in Scotland no denomination of Chriſtians but thoſe of the Preſbyterian church, eſtabliſhed by law, the Proteſtant Epiſcopalians, whoſe church had been eſtabliſhed prior to that event, and the adherents to the church of Rome. The Epiſcopalians and Papiſts were effectually excluded from every office in which they could injure the eccleſiaſtical eſtabliſhment, by the ſeveral reſtrictions under which they were laid, on account of their attachment, real or ſuppoſed, to the abdicated family of Stuart. The penal laws operated upon them more powerfully than a religious teſt. It is to be obſerved too, that in the church of Scotland, though her clergy are better provided for than any other parochial clergy perhaps in Europe (A), there is nothing of that ſplendor and temporal power which in England excite envy to clamour againſt the eſtabliſhment, under the pretence of maintaining the cauſe of religious liberty. Yet even in Scotland a religious teſt is occaſionally exacted of civil officers. In the royal boroughs of that part of the united kingdom, no man can hold the office of a magiſtrate without previouſly ſwearing the burgeſs-oath (ſee SECEDER, N° 8.); and every inſtructor of youth, whether in ſchools or colleges, may be called upon to qualify himſelf for his office, by ſubſcribing the eſtabliſhed Confeſſion of Faith. The burgeſs-oath is a more effectual teſt than that which is required of magiſtrates in England; for a man might with a ſafe conſcience receive the ſacrament of the Lord's Supper occaſionally in a church "at which he would not ſwear to abide and defend the ſame to his *life's end*." This teſt appears to us to be neceſſary in boroughs, where faction is commonly blended with fanaticiſm; and if thoſe ſectaries which, at their firſt appearance in 1732, were inſignificant, if not contemptible, continue to multiply, and to imbibe principles much more pernicious than thoſe which were held by their fathers, it may perhaps be found expedient to extend ſome teſt over the whole country.

We do not, however, by any means, wiſh to ſee the ſacramental teſt introduced into Scotland. A teſt may be neceſſary to ſecure to the church all her rights and immunities; but to receive the ſacrament can give her no ſuch ſecurity, whilſt it leads inevitably to the profanation of a ſacred ordinance. A much better teſt would be, to require every man, before he be admitted to an executive office, to ſwear that in the diſcharge of it he will be careful to maintain all the rights and privileges of the church eſtabliſhed by law. Such an oath no ſenſible and peaceable diſſenter could refuſe; for it would not bind him to communicate with the eſtabliſhed church; and he cannot be ignorant that it belongs not to the executive government, but to the legiſlature, to determine what ſhall be the religion of the ſtate. On this account, we cannot help thinking that the members of

(A) There are indeed many livings in the church of England, and probably in other churches, to which nothing in the church of Scotland can be compared in reſpect of emolument; but theſe rich benefices bear no proportion to the number of thoſe which, in this age of unavoidable expence, cannot afford to the incumbents the means of decent ſubſiſtence as gentlemen. In the church of Scotland many livings amount to 200l. each annually; and we have reaſon to hope, that when the preſent plan for augmenting the ſtipends of the clergy has been extended over Scotland, very few will be below 100l.; whilſt in England the vicarages and ſmall rectories, from which we have reaſon to believe that the incumbents reap not 80l. a-year, greatly exceed in number all the livings in Scotland? Nay we doubt if there be not upwards of a thouſand livings in England and Wales from which the rector or vicar derives not above 50l. annually.

of the legiſlative body ſhould be ſubjected to no religious teſt whatever, that they may be at freedom to reform the corruptions of the church, or to exchange one eſtabliſhment for another, ſhould they find ſuch exchange expedient. If this reaſoning be juſt, it will be difficult to vindicate that clauſe of 25 Car. II. and of 1 Geo. I. in which it is enacted, that no member ſhall vote or ſit in either houſe of parliament till he hath, in the preſence of the houſe, ſubſcribed and repeated the declaration againſt tranſubſtantiation, the invocation of ſaints, and the ſacrifice of the maſs. The church of Rome is indeed a very corrupt ſociety; but if it be not for the purity of her doctrines and government that any church is eſtabliſhed in preference to all others, why ſhould that particular church be precluded from the poſſibility of obtaining a legal eſtabliſhment in Great Britain, even though ſhe were to become moſt acceptable to the majority of all ranks in the kingdom? The Engliſh Catholics have unqueſtionably greater reaſon to complain of this teſt, than either they or the diſſenters have to complain of the law which requires every civil and military officer to receive the Lord's Supper in the eſtabliſhed church.

TEST for Acids and Alkalies. See CHEMISTRY.

TEST Liquors for Wines. See WINE.

TESTACEA, in the Linnæan ſyſtem, comprehends the third order of vermes, or ſhell-fiſh. See CONCHOLOGY *Index*.

TESTACEOUS, in *Natural Hiſtory*, an epithet ſynonymous with TESTACEA. See above.

TESTAMENT, or LAST WILL. Teſtaments both Juſtinian and Sir Edward Coke agree to be ſo called, becauſe they are *teſtatio mentis*: an etymon which ſeems to favour too much of conceit; it being plainly a ſubſtantive derived from the verb *teſtari*, in like manner as *juramentum*, *incrementum*, and others, from other verbs. The definition of the old Roman lawyers is much better than their etymology; *voluntatis noſtræ juſta ſententia de eo, quod quis poſt mortem ſuam fieri velit*: which may be thus rendered into Engliſh, "the legal declaration of a man's intentions, which he wills to be performed after his death." It is called *ſententia*, to denote the circumſpection and prudence with which it is ſuppoſed to be made: it is *voluntatis noſtræ ſententia*, becauſe its efficacy depends on its declaring the teſtator's intention, whence in Engliſh it is emphatically ſtyled his *will*; it is *juſta ſententia*; that is, drawn, atteſted, and publiſhed, with all due ſolemnities and forms of law; it is *de eo, quod quis poſt mortem ſuam fieri velit*, becauſe a teſtament is of no force till after the death of the teſtator.

Blackſt. Comment. vol. ii.

Theſe teſtaments are divided into two ſorts; written, and verbal or nuncupative; of which the former is commited to writing: the latter depends merely upon oral evidence, being declared by the teſtator in *extremis*, before a ſufficient number of witneſſes, and afterwards reduced to writing.

But as nuncupative wills and CODICILS (which were formerly more in uſe than at preſent when the art of writing is become more general) are liable to great impoſitions, and may occaſion many perjuries, the ſtatute of frauds 29 Car. II. c. 3. enacts, 1. That no written will ſhall be revoked or altered by a ſubſequent nuncupative one, except the ſame be in the lifetime of the teſtator reduced to writing, and read over to him, and approved; and unleſs the ſame be proved to have been ſo done by the oaths of three witneſſes at the leaſt, who, by ſtatute 4 and 5 Anne, c. 16. muſt be ſuch as are admiſſible upon trials at common law. 2. That no nuncupative will ſhall in anywiſe be good, where the eſtate bequeathed exceeds 30l. unleſs proved by three ſuch witneſſes, preſent at the making thereof (the Roman law requiring ſeven), and unleſs they or ſome of them were ſpecially required to bear witneſs thereto by the teſtator himſelf; and unleſs it was made in his laſt ſickneſs, in his own habitation or dwelling-houſe, or where he had been previouſly reſident ten days at the leaſt, except he be ſurpriſed with ſickneſs on a journey, or from home, and dies without returning to his dwelling. 3. That no nuncupative will ſhall be proved by the witneſſes after ſix months from the making, unleſs it were put in writing within ſix days. Nor ſhall it be proved till fourteen days after the death of the teſtator, nor till proceſs hath firſt iſſued to call in the widow, or next of kin, to conteſt it if they think proper. Thus hath the legiſlature provided againſt any fraud in ſetting up nuncupative wills, by ſo numerous a train of requiſites, that the thing itſelf has fallen into diſuſe; and hardly ever heard of, but in the only inſtance where favour ought to be ſhown to it, when the teſtator is ſurpriſed by ſudden and violent ſickneſs. The teſtamentary words muſt be ſpoken with an intent to bequeath, not any looſe idle diſcourſe in his illneſs; for he muſt require the byſtanders to bear witneſs of ſuch his intention; the will muſt be made at home, or among his family or friends, unleſs by unavoidable accident, to prevent impoſitions from ſtrangers: it muſt be in his laſt ſickneſs; for if he recovers, he may alter his diſpoſitions, and have time to make a written will: it muſt not be proved at too long a diſtance from the teſtator's death, leſt the words ſhould eſcape the memory of the witneſſes; nor yet too haſtily and without notice, leſt the family of the teſtator ſhould be put to inconvenience or ſurpriſe.

As to written wills, they need not any witneſs of their publication. We ſpeak not here of deviſes of lands, which are entirely another thing, a conveyance by ſtatute, unknown to the feodal or common law, and not under the ſame juriſdiction as perſonal teſtaments. But a teſtament of chattels, written in the teſtator's own hand, though it has neither his name nor ſeal to it, nor witneſſes preſent at its publication, is good; provided ſufficient proof can be had that it is his hand-writing. And though written in another man's hand, and never ſigned by the teſtator, yet if proved to be according to his inſtructions and approved by him, it hath been held a good teſtament of the perſonal eſtate. Yet it is the ſafer and more prudent way, and leaves leſs in the breaſt of the eccleſiaſtical judge, if it be ſigned or ſealed by the teſtator, and publiſhed in the preſence of witneſſes; which laſt was always required in the time of Bracton; or rather he in this reſpect has implicitly copied the rule of the civil law.

No teſtament is of any effect till after the death of the teſtator; *Nam omne teſtamentum morte conſummatum eſt, et voluntas teſtatoris eſt ambulatoria uſque ad mortem.* And therefore, if there be many teſtaments, the laſt will overthrows all the former; but the republication of a former will revoke one of a later date, and eſtabliſhes the firſt again.

Regularly, every perſon hath full power and liberty to make a will, that is not under ſome ſpecial prohibition by

by law or cuſtom: which prohibitions are principally upon three accounts; for want of ſufficient diſcretion; for want of ſufficient liberty and free-will; and on account of criminal conduct.

1. In the firſt ſpecies are to be reckoned infants, under the age of 14 if males, and 12 if females; which is the rule of the civil law. For though ſome of our common lawyers have held that an infant of any age (even four years old) might make a teſtament, and others have denied that under 18 he is capable; yet as the eccleſiaſtical court is the judge of every teſtator's capacity, this caſe muſt be governed by the rules of the eccleſiaſtical law. So that no objection can be admitted to the will of an infant of 14, merely for want of age; but if the teſtator was not of ſufficient diſcretion, whether at the age of 14 or 24, that will overthrow his teſtament. Madmen, or otherwiſe *non compotes*, idiots or natural fools, perſons grown childiſh by reaſon of old age or diſtemper, ſuch as have their ſenſes beſotted with drunkenneſs,—all theſe are incapable, by reaſon of mental diſability, to make any will ſo long as ſuch diſability laſts. To this claſs alſo may be referred ſuch perſons as are born deaf, blind, and dumb; who, as they have always wanted the common inlets of underſtanding, are incapable of having *animum teſtandi*, and their teſtaments are therefore void.

2. Such perſons as are inteſtable for want of liberty or freedom of will, by the civil law are of various kinds; as priſoners, captives, and the like. But the law of England does not make ſuch perſons abſolutely inteſtable; but only leaves it to the diſcretion of that court to judge upon the conſideration of their particular circumſtances of dureſs, whether or no ſuch perſons could be ſuppoſed to have *liberum animum teſtandi*. And with regard to feme-coverts, our laws differ ſtill more materially from the civil. Among the Romans there was no diſtinction; a married woman was as capable of bequeathing as a feme-ſole. But with us a married woman is not only utterly incapable of deviſing lands, being excepted out of the ſtatute of wills, 34 and 35 Hen. VIII. c. 5. but alſo ſhe is incapable of making a teſtament of chattels, without the licenſe of her huſband. For all her perſonal chattels are abſolutely his own; and he may diſpoſe of her chattels real, or ſhall have them to himſelf, if he ſurvives her: it would be therefore extremely inconſiſtent to give her a power of defeating that proviſion of the law, by bequeathing thoſe chattels to another. The queen-conſort is an exception to this general rule, for ſhe may diſpoſe of her chattels by will, without the conſent of her lord; and any feme-covert may make her will of goods which are in her poſſeſſion *in auter droit*, as executrix or adminiſtratrix; for theſe can never be the property of the huſband: and if ſhe has any pin-money or ſeparate maintenance, it is ſaid ſhe may diſpoſe of her ſavings thereout by teſtament, without the controul of her huſband. But if a female ſole makes her will, and afterwards marries, ſuch ſubſequent marriage is eſteemed a revocation in law, and entirely vacates the will.

3. Perſons incapable of making teſtaments on account of their criminal conduct, are in the firſt place all traitors and felons, from the time of conviction; for then their goods and chattels are no longer at their own diſpoſal, but forfeited to the king. Neither can a *felo de ſe* make a will of goods and chattels, for they are forfeited by the act and manner of his death; but he may make a deviſe of his lands, for they are not ſubject to any forfeiture. Outlaws alſo, though it be but for debt, are incapable of making a will ſo long as the outlawry ſubſiſts, for their goods and chattels are forfeited during that time. As for perſons guilty of other crimes, ſhort of felony, who are by the civil law precluded from making teſtaments (as uſurers, libellers, and others of a worſe ſtamp), at the common law their teſtaments may be good. And in general the rule is, and has been ſo at leaſt ever ſince Glanvil's time, *quod libera ſit cujuſcunque ultima voluntas*.

Teſtaments may be avoided three ways: 1. If made by a perſon labouring under any of the incapacities before-mentioned; 2. By making another teſtament of a later date; and, 3. By cancelling or revoking it. For though I make a laſt will and teſtament irrevocable in the ſtrongeſt words, yet I am at liberty to revoke it; becauſe mine own act or words cannot alter the diſpoſition of law, ſo as to make that irrevocable which is in its own nature revocable. For this, ſaith Lord Bacon, would be for a man to deprive himſelf of that which, of all other things, is moſt incident to human condition; and that is, alteration or repentance. It hath alſo been held, that, without an expreſs revocation, if a man, who hath made his will, afterwards marries and hath a child, this is a preſumptive or implied revocation of his former will which he made in his ſtate of celibacy. The Romans were alſo wont to lay aſide teſtaments as being *inofficioſa*, deficient in natural duty, if they diſinherited or totally paſſed by (without aſſigning a true and ſufficient reaſon) any of the children of the teſtator. But if the child had any legacy, though ever ſo ſmall, it was a proof that the teſtator had not loſt his memory or his reaſon, which otherwiſe the law preſumed; but was then ſuppoſed to have acted thus for ſome ſubſtantial cauſe: and in ſuch caſe no *querela inofficioſi teſtamenti* was allowed. Hence probably has ariſen that groundleſs vulgar error of the neceſſity of leaving the heir a ſhilling, or ſome other expreſs legacy, in order to diſinherit him effectually; whereas the law of England makes no ſuch wild ſuppoſition of forgetfulneſs or inſanity; and therefore, though the heir or next of kin be totally omitted, it admits no *inofficioſi* to ſet aſide ſuch a teſtament.

TESTAMENT, in *Scots Law*. See LAW, N° clxxxi. 2. &c.

TESTAMENT, *Old* and *New*. See BIBLE and SCRIPTURE.

TESTATOR, the perſon who makes his will and teſtament.

TESTER, TESTON, the name of a coin ſtruck in France by Louis XII. in 1513, and in Scotland in the time of Francis II. and Mary queen of Scotland, ſo called from the head of the king, which was engraved upon it. The ſilver it contained was 11 deniers 18 grains, its weight ſeven deniers 11¼ grains, and its value 10 ſols. The coinage of it was prohibited by Henry III. in 1575, when the value of it was augmented to 14 ſols ſix deniers. The teſton or teſter among us was rated at 12d. in the reign of Henry VIII. and afterwards reduced to 6d.

TESTES, in *Anatomy*, the teſticles. See the next article.

TESTICLE (*testis*), a double part in animals of the male kind, serving for the office of generation. See ANATOMY, N° 107.

TESTIMONY. See LOGIC, N° 29, and METAPHYSICS, N° 135—138.

TESTIMONY, in *Law*. See EVIDENCE.

TESTUDO, the TORTOISE, a genus of animals belonging to the class of amphibia, and order of reptilia. See ERPETOLOGY *Index*.

TESTUDO, in antiquity, was particularly used among the poets, &c. for the ancient lyre; because it was originally made by its inventor Mercury, of the back or hollow of the testudo aquatica, or sea-tortoise, which he accidentally found on the banks of the river Nile. See LYRE.

TESTUDO, in the military art of the ancients, was a kind of cover or screen which the soldiers, *e. gr.* a whole company, made themselves of their bucklers, by holding them up over their heads, and standing close to each other. This expedient served to shelter them from darts, stones, &c. thrown upon them, especially those thrown from above, when they went to the assault.

TESTUDO, was also a kind of large wooden tower which moved on several wheels, and was covered with bullock-hides, serving to shelter the soldiers when they approached the walls to mine them, or to batter them with rams. It was called *testudo*, from the strength of its roof, which covered the workmen as the shell does the tortoise.

TETANUS, a dreadful spasmodic disorder, in which the whole body becomes rigid and inflexible. It most commonly proves mortal. See MEDICINE, N° 279.

TETHYS, a genus of insects belonging to the class of vermes, and order of mollusca. See HELMINTHOLOGY *Index*.

TETRACERA, a genus of plants belonging to the class polyandria; and in the natural system ranging under the doubtful. See BOTANY *Index*.

TETRADYNAMIA, (τεσσαρες "four," and δυναμις "power"), four powers; the name of the 15th class in Linnæus's Sexual System. See BOTANY *Index*.

TETRAGONIA, a genus of plants belonging to the class icosandria; and in the natural method ranging under the 13th order, *succulentæ*. See BOTANY *Index*.

TETRAGRAMMATON, τετραγραμματον, a denomination given by the Greeks to the Hebrew name of God יהוה, "*Jehova*," because in the Hebrew it consists of four letters.

TETRAGYNIA, (τεσσαρες, "four," and γυνη "a woman"); the name of an order, or secondary division, in the Sexual System. See BOTANY *Index*.

TETRANDRIA, (τεσσαρες "four," and ανηρ "a man or husband"); the name of the fourth class in the Linnæan System. See BOTANY *Index*.

TETRAO, a genus of birds belonging to the order of gallinæ. See ORNITHOLOGY *Index*.

TETRODON, a genus of fishes arranged by Linnæus under the class of *amphibia*, and order of *nantes*; but placed by Gmelin under the class of *pisces*, and order of *branchiostegi*. See ICHTHYOLOGY *Index*.

TETRARCH, a prince who holds and governs a fourth part of a kingdom. Such originally was the import of the title *tetrarch*; but it was afterwards applied to any petty king or sovereign; and became synonymous with ethnarch, as appears from the following considerations: 1. That Pliny makes mention of six tetrarchies within the city of Decapolis. 2. That Herod's kingdom was only divided into three parts, which yet were called *tetrarchies*, and the sovereigns thereof, Luke iii. 1. *tetrarchs*. 3. Josephus tells us, that, after the battle of Philippi, Antony, going into Syria, constituted Herod *tetrarch*; and on medals the same Herod is called *ethnarch*.

TETRASTYLE, in the ancient architecture, a building, and particularly a temple, with four columns in its front.

TETUAN, an ancient and pleasant town of Africa, in the kingdom of Fez, and in the province of Habata. It is pretty well built, and the inhabitants are about 15,000 in number, who call themselves *Andalusians*, and almost all speak Spanish; but they are great pirates. Some say there are 30,000 Moorish inhabitants, and 5000 Jews. W. Long. 5. 26. N. Lat. 35. 27. *Josephus's Antiq.* b. xiv. c. 23.

TEUCRIUM, GERMANDER, a genus of plants belonging to the class didynamia; and in the natural system ranging under the 42d order, *Verticillatæ*. See BOTANY *Index*.

TEUTHIS, a genus of fishes belonging to the order of abdominales. See ICHTHYOLOGY *Index*.

TEUTONES, or TEUTONI, in *Ancient Geography*, a people always by historians joined with the Cimbri; both seated, according to Mela, beyond the Elbe, on the Sinus Codanus, or Baltic; and there it is supposed, lay the country of the Teutones, now *Ditmarsh*; diversity of dialects producing the different terms *Teut*, *Tut*, *Dit*, *Tid*, and *Thod*, which in the ancient German language signified *people*. Of these Teutones, Virgil is to be understood in the epithet *Teutonicus*, an appellation which more lately came to be applied to the Germans in general, and later still the appellation *Alemanni*.

The Teutones, in conjunction with the Cimbri and Ambrones, made war on the Romans, and marched towards Italy in the year 101 B. C. We are told, that the Teutones alone were so numerous, that they were six whole days without intermission in passing by the Roman camp. In Transalpine Gaul they engaged the Roman consul Marius; but were defeated with incredible slaughter; 100,000 of them, according to the lowest calculations, being killed on the spot. According to others, the number of those killed and taken prisoners amounted to 290,000. The inhabitants made fences for vineyards of their bones. Their king Teutobochus, said to be a monstrous giant, was taken prisoner and carried to Rome. See GIANT.

TEUTONIC, something belonging to the Teutones. The Teutonic language is supposed to have been the language of the ancient Germans, and hence is reckoned amongst the mother-tongues. See PHILOLOGY, N° 219.

TEUTONIC Order, an order of military knights, established towards the close of the twelfth century, on the following occasion.—When the emperor Barbarossa engaged in a crusade for the recovery of the Holy Land out of the hands of Saladin, he was followed by great numbers of German volunteers, who from various motives enlisted under his banners. After the death of Barbarossa, the Germans, who had signalized themselves before Acre or Ptolemais, resolved to choose another leader; and at last fixed their choice upon Frederic

duke

duke of Suabia, ſecond ſon to the emperor, and Henry duke of Brabant. Under theſe generals they behaved with ſo much bravery, that Henry king of Jeruſalem, the patriarch, and ſeveral other princes, determined to reward their valour by inſtituting an order of knighthood in their favour. This was accordingly done; and our new knights had at firſt the title of the *knights of St George;* afterwards it was thought proper to put them under the tutelage of the Virgin Mary, to whom there was already an hoſpital dedicated on Mount Zion, for the relief of German pilgrims. From this time they were called *Equites Mariani*, or knights of St Mary. Laws, regulations, and ſtatutes, were drawn up for them by the Chriſtian kings in Syria and the patriarch; and among other obligations it was required, that every perſon admitted to the privileges of the order ſhould be of noble parentage; that the order ſhould defend the Chriſtian religion and the Holy Land; that they ſhould exerciſe hoſpitality towards the Chriſtians in general, but particularly thoſe of their own country; and that they ſhould with all their power endeavour to propagate and extend the Chriſtian faith and the religion of Jesus. In the year 1190, having become rich by donations from the ſuperſtitious, they elected their firſt grand-maſter, Henry Walpot, a German, who had diſtinguiſhed himſelf by his zeal and valour; and their choice was confirmed by the emperor. The following year, Pope Celeſtine III. confirmed their privileges already granted, giving them the title of the *Teutonic knights of the hoſpital of St Mary the Virgin.* By the conditions of this bull, they vowed perpetual continence, obedience, and poverty; obligations which it may well be imagined were not very ſtrictly kept. See Poland, N° 59, 61, 67—69, and Prussia, N° 3, 4.

TEWIT. See Tringa, Ornithology *Index.*

TEWKESBURY, a town in Glouceſterſhire, formerly noted for its monaſtery, and now containing about 500 houſes, with a magnificent church. It is ſeated at the confluence of the rivers Severn and Avon, has a cotton manufactory, and ſends two members to parliament. W. Long. 2. 13. N. Rat. 52. 0.

TEXEL, a town of the United Provinces, in North Holland, ſeated at the mouth of the Zuyder-Zee, with a good harbour, and a ſtrong fort. It is ſeated in a fruitful iſland, known all over the world by the great number of ſhips that paſs this way every day from all parts; it is about ſix miles long and five broad, lying a little northward of the continent of Holland, between which and the iſland is one of the principal paſſages out of the Zuyder-Zee into the ocean. It is defended from the ſea by ſand hills and ſtrong banks. Moſt of the ſoil is applied to feed ſheep, of which they have great flocks; and the cheeſe made of their milk is ſaid to vie with the Parmeſan. This iſland contains ſeveral fair villages, and a town on the eaſt ſide, called *Burch*, ſtrongly fortified and garriſoned, and inhabited chiefly by fiſhermen. N. Lat. 53. 8. E. Long. 4. 51.

Nugent's Grand Tour, vol. i.

TEXT, a relative term, contradiſtinguiſhed to gloſs or commentary, and ſignifying an original diſcourſe excluſive of any note or interpretation. This word is particularly uſed for a certain paſſage of ſcripture, choſen by a preacher to be the ſubject of his ſermon.

TEXTURE, properly denotes the arrangement and coheſion of ſeveral ſlender bodies or threads interwoven or entangled among each other, as in the webs of ſpiders, or in the cloths, ſtuffs, &c.

Texture is alſo uſed in ſpeaking of any union or conſtituent particles of a concrete body, whether by weaving, hooking, knitting, tying, chaining, indenting, intruding, compreſſing, attracting, or any other way. In which ſenſe we ſay, a cloſe compact texture, a lax porous texture, a regular or irregular texture, &c.

THABOR. See Tabor.

THALES, a celebrated Greek philoſopher, and the firſt of the ſeven wiſe men of Greece, was born at Miletus about 640 B. C. In order to improve himſelf in the knowledge of the ſciences, he travelled into Egypt, where he diſcourſed with the prieſts and other learned men. Some ſay that he married; but others obſerve, that he eluded the ſolicitations of his mother on this head, by telling her, when he was young, that it was too ſoon; and afterwards, that it was too late. Thales acquired great reputation by his wiſdom and learning: he was the firſt among the Greeks who foretold eclipſes of the ſun, and made extraordinary diſcoveries in aſtronomy. Thales was the author of the Ionian ſect of philoſophers, who were thus called from his being born at Miletus, a city of Ionia. He maintained that water was the principle of which all the bodies in the univerſe are compoſed; that the world was the work of God; and that God ſees the moſt ſecret thoughts in the heart of man. He ſaid, "That the moſt difficult thing in the world is to know ourſelves; the moſt eaſy to adviſe others; and the moſt ſweet to accompliſh our deſires. That, in order to live well, we ought to abſtain from what we find fault with in others. That the bodily felicity conſiſts in health, and that of the mind in knowledge. That the moſt ancient of beings is God, becauſe he is uncreated: that nothing is more beautiful than the world, becauſe it is the work of God; nothing more extenſive than ſpace, quicker than ſpirit, ſtronger than neceſſity, wiſer than time." It was alſo one of his ſentences, "That we ought never to ſay that to any one that may be turned to our prejudice; and that we ſhould live with our friends as with perſons that may become our enemies." He thanked God for three things; that he was born of the human, not of the brute ſpecies; a man, and not a woman; a Greek, and not a barbarian. None of the ancient philoſophers ever applied themſelves more earneſtly to the ſtudy of aſtronomy than Thales. Diogenes Laertius reports, that leaving his lodging with an old woman to contemplate the ſtars, he fell into a ditch; on which the good woman cried, "How canſt thou know what is doing in the heavens, when thou canſt not perceive what is at thy feet?" He went to ſee Crœſus, who was marching with a powerful army into Cappadocia, and enabled him to paſs the river Halys without making a bridge. Thales died ſoon after, at about 90 years of age. He compoſed ſeveral treatiſes in verſe, on meteors, the equinoxes, &c. but they are all loſt.

THALIA, in Pagan mythology, one of the nine muſes. She preſided over Comedy; and is repreſented crowned with a garland of ivy, holding a maſk in her hand, and wearing buſkins on her feet.

Thalia, a genus of plants belonging to the claſs monandria; and in the natural ſyſtem ranging under the 8th order, *Scitamineæ.* See Botany *Index.*

THALICTRUM,

Thalictrum, Thames.

THALICTRUM, MEADOW-RUE, a genus of plants belonging to the class polyandria; and in the natural system ranging under the 26th order, *Multisiliquæ*. See BOTANY *Index*.

THAMES, the finest river in Great Britain, which takes its rise from a copious spring, called *Thames Head*, two miles south-west of Cirencester in Gloucestershire. It has been erroneously said, that its name is Isis till it arrives at Dorchester, 15 miles below Oxford, when, being joined by the Thame or Tame, it assumes the name of the Thames, which, it has been observed, is formed from a combination of the words Thame and Isis. What was the origin of this vulgar error, cannot now be traced. Poetical fiction, however, has perpetuated this error, and invested it with a kind of classical sanctity. "It plainly appears (says Camden), that the river was always called *Thames* or *Tems*, before it came near the Thame; and in several ancient charters granted to the abbey of Malmsbury, as well as that of Ensham, and in the old deeds relating to Cricklade, it is never considered under any other name than that of *Thames*." He likewise says, that it occurs nowhere under the name of Isis. All the historians who mention the incursions of Ethelwold into Wiltshire in the year 905, or of Canute in 1016, concur likewise in the same opinion, by declaring, that they passed over the Thames at Cricklade in Wiltshire. It is not probable, moreover, that Thames Head, an appellation by which the source has usually been distinguished, should give rise to a river of the name of Isis; which river, after having run half its course, should reassume the name of Thames, the appellation of its parent spring. About a mile below the source of the river is the first corn-mill, which is called *Kemble Mill*. Here the river may properly be said to form a constant current; which, though not more than nine feet wide in the summer, yet in the winter becomes such a torrent as to overflow the meadows for many miles around. But, in the summer, the Thames Head is so dry, as to appear nothing but a large dell, interspersed with stones and weeds. From Somerford the stream winds to Cricklade, where it unites with many other rivulets. Approaching Kemsford, it again enters its native county, dividing it from Berkshire at Inglesham. It widens considerably in its way to Lechlade; and being there joined by the Lech and Coln, at the distance of 138 miles from London, it becomes navigable for vessels of 90 tons. At Ensham, in its course north-east, to Oxford, is the first bridge of stone; a handsome one, of three arches, built by the earl of Abingdon. Passing by the ruins of Godstow nunnery, where the celebrated Fair Rosamond was interred, the river reaches Oxford, in whose academic groves its poetical name of Isis has been so often invoked. Being there joined by the Charwell, it proceeds south-east to Abingdon, and thence to Dorchester, where it receives the Tame. Continuing its course south-east by Wallingford to Reading, and forming a boundary to the counties of Berks, Bucks, Surry, Middlesex, Essex, and Kent, it washes the towns of Henley, Marlow, Maidenhead, Windsor, Eton, Egham, Staines, Laleham, Chertsey, Weybridge, Shepperton, Walton, Sunbury, East and West Moulsey, Hampton, Thames Ditton, Kingston, Teddington, Twickenham, Richmond, Isleworth, Brentford, Kew, Mortlake, Barnes, Chiswick, Hammersmith, Putney, Fulham, Wandsworth, Battersea, Chelsea, and Lambeth. Then, on the north bank of the river, are Westminster and London, and, on the opposite side, Southwark; forming together one continued city, extending to Limehouse and Deptford; and hence the river proceeds to Greenwich, Erith, Greenhithe, Gray's Thurrock, Gravesend, and Leigh, into the ocean. It receives in its course from Dorchester the rivers Kennet, Loddon, Coln, Wey, Mole, Wandle, Lea, Roding, Darent, and Medway. The jurisdiction of the lord mayor of London over the Thames extends from Coln ditch, a little to the west of Staines, to Yendal or Yenleet to the east, including part of the rivers Medway and Lea; and he has a deputy, named the water-bailiff, who is to search for and punish all offenders against the laws for the preservation of the river and its fish. Eight times a year the lord mayor and aldermen hold courts of conservance for the four counties of Surry, Middlesex, Essex, and Kent. Though the Thames is said to be navigable 138 miles above the bridge, yet there are so many flats, that in summer the navigation westward would be entirely stopped, when the springs are low, were it not for a number of locks. But these are attended with considerable expence; for a barge from Lechlade to London pays for passing through them 13l. 15s. 6d. and from Oxford to London 12l. 18s. This charge, however, is in summer only, when the water is low; and there is no lock from London bridge to Bolter's lock; that is, for 51¼ miles above the bridge. The plan of new cuts has been adopted, in some places, to shorten and facilitate the navigation. There is one near Lechlade, which runs nearly parallel to the old river, and contiguous to St John's bridge; and there is another a mile from Abingdon, which has rendered the old stream toward Culham bridge useless. But a much more important undertaking has lately been accomplished; namely, the junction of this river with the Severn. A canal had been made, by virtue of an act of parliament in 1730, from the Severn to Wallbridge, near Stroud. A new canal now ascends by Stroud, through the vale of Chalford, to the height of 343 feet, by means of 28 locks, and thence to the entrance of a tunnel near Sapperton, a distance of near eight miles. The canal is 42 feet in width at top and 30 at the bottom. The tunnel (which is extended under Sapperton hill, and under that part of Earl Bathurst's grounds called *Haley wood*, making a distance of two miles and three furlongs) is near 15 feet in width, and can navigate barges of 70 tons. The canal descending hence 134 feet, by 14 locks, joins the Thames at Lechlade, a distance of above 20 miles. In the course of this vast undertaking, the canal, from the Severn at Froomlade to Inglesham, where it joins the Thames, is a distance of more than 30 miles. The expence of it exceeded the sum of 200,000l. of which 3000l. are said to have been expended in gunpowder alone, used for the blowing up of the rock. This new canal was completed in 1789, in less than seven years from its commencement. A communication, not only with the Trent, but with the Mersey, has likewise been effected by a canal from Oxford to Coventry; and an act of parliament has passed to extend another canal from this, at Braunston, to the Thames at Brentford. This is to be called *The Grand Junction Canal*. On the extensive advantages resulting from these navigable communications from the metropolis with the ports of Bristol, Liverpool, Hull, &c. and

Brooke's Gazetteer.

Thames.

and the principal manufacturing towns in the inland parts of the kingdom, it is needless to expatiate. The tide flows up the Thames as high as Richmond, which, following the winding of the river, is 70 miles from the ocean; a greater distance than the tide is carried by any other river in Europe. The water is esteemed extremely wholesome, and fit for use in very long voyages, during which it will work itself perfectly fine.

THAMES is also the name of a river in the state of Connecticut in America. See the article CONNECTICUT.

THANE, or THANUS, a name given to the nobility in Britain before the time of William the Conqueror. It signifies a minister or honourable retainer, from the verb *thenian*, "to minister." There were several degrees of nobility among the Anglo-Saxons; but those most commonly mentioned are the king's thanes and the alderman's thanes. The king's thanes seem to have been of three different degrees, according to their different degrees of wealth or favour at court. The alderman's thanes seem to have been of the lowest degree of nobility, and next to them those who were promoted to that dignity from their advancement in the church, from their valour, success in agriculture or commerce: for if a ceorl or farmer applied to learning and attained to priests orders; if he acquitted himself so well as to obtain from a nobleman five hythes of land, or a gilt sword, helmet, and breast-plate, the reward of his valour; or if by his industry he had acquired the property of five hythes of land; or if he applied to trade, and made three voyages beyond sea in a ship of his own, and a cargo belonging to himself, he was denominated a *thane*.

The thanes, who were the only nobility among the Anglo-Saxons, were a very numerous body of men, comprehending all the considerable landholders in England, and filling up that space in society between the ceorls or yeomanry on the one hand, and the royal family on the other; which is now occupied both by the nobility and gentry. In times of war, they constituted the flower of their armies, and in times of peace they swelled the trains of their kings, and added greatly to the splendour of their courts, especially at the three great festivals of Christmas, Easter, and Whitsuntide. From this body all the chief officers, both civil and military, as aldermen, greeves, earls, heretogens, &c. were taken; and to obtain some of these offices was the great object of their ambition. Before they obtained an office, their lands were their only support; and they lived in greater or less affluence, according to the extent of their estates. These they divided into two parts; one of which they called their *inlands*, and the other their *outlands*. Their inlands they kept in their own immediate possession, and cultivated them by the hands of their slaves and villains, in order to raise provisions for their families; their outlands they granted to ceorls or farmers, either for one year, or for a term of years; for which they received a certain stipulated proportion of their produce annually. These customs had long prevailed among their ancestors in Germany, and were adhered to by their posterity in England till the conquest.

Henry's History of Great Britain, vol. ii.

The thanes were under no obligations on account of their lands, except the three following, which were indispensably necessary to the defence and improvement of their country: To attend the king with their followers in military expeditions, to assist in building and defending the royal castles, and in keeping the bridges and highways in proper repair. To these obligations all proprietors of land (even the churchmen for a long time not excepted) were subjected; and these services were considered as due to their country, rather than to the persons of their kings; and were agreed to by all as being necessary to their own preservation and conveniency.

This title of thane was abolished in England at the conquest, upon the introduction of the feudal system by William. The titles of earl and baron were about the same period introduced into Scotland by Malcolm Canmore, when the title of thane fell into disuse.

THANET, an island of the county of Kent, surrounded by the sea except on the north-east side, where it is bounded by the branches of the river Stour, now inconsiderable to what they were formerly. It contains several villages, and the sea port towns of Margate and Ramsgate, and has the title of an earldom. It is celebrated for being the spot through which arts, sciences, and divine knowledge, came into this happy isle. The Britons called it *Richborough*, from its vicinity to the city of that name, now only a venerable ruin; but the Saxons called it *Thanet*, from fire, having so many beacons erected on it. It is in the north-east part of the county, lies open to the sea on the north and east, with the river Wantsum on the west and south, is about 10 miles long from the North Foreland to Sarre-Bridge, and about 8 broad from Westgate to Sandwich-Ferry. The north part of it is chiefly arable; and the south and west parts consist of marsh or pasture-lands. The soil is generally very fertile, especially in producing the best barley, of which it is computed above 20,000 quarters are annually sent to London.

Lucombe's England's Gazetteer.

THAPSIA, the DEADLY CARROT, a genus of plants belonging to the class *pentandria*, and in the natural system ranging under the 45th order, *umbellatæ*. See BOTANY *Index*.

THAWING, the resolution of ice into its former fluid state by the warmth of the air. See CONGELATION and FROST.

THEA. See TEA.

THEATINES, a religious order in the Romish church, so called from their principal founder John Peter Caraffa, then bishop of Theate, or Chieti, in the kingdom of Naples, and afterwards pope, under the name of Paul IV. The names of the other founders were Gaetan, Boniface, and Consiglieri. These four pious men desiring to reform the ecclesiastical state, laid the foundation of an order of regular clerks at Rome in the year 1524. Pope Clement VII. approved the institution, and permitted the brethren to make the three religious vows, to elect a superior every three years, and to draw up statutes for the regulation of the order. They were the first who endeavoured, by their example, to revive among the clergy the poverty of the apostles and first disciples of our Saviour, and were also the first who assumed the title of *regular clerks*.

THEATRE, a place in which shows or dramatic representations are exhibited.

For the origin of the dramatic art we always turn our eyes to Greece, the nursery of the arts and sciences. It may indeed have been known among more ancient nations,

Theatre.

nations, but no records remain ſufficient to ſupport this opinion. The different ſtates of Greece aſſerted their claim to the honour of having given it birth, but the account of the Athenians is moſt generally received. It derived its origin from the hymns which were ſung in the feſtivals of Bacchus in honour of that deity. While theſe reſounded in the ears of the multitude, choruſes of Bacchants and Fauns, ranged round certain obſcene images which they carried in triumphal proceſſion, chanted laſcivious ſongs, and ſometimes ſacrificed individuals to public ridicule.

This was the practice in the cities; but a ſtill greater licentiouſneſs reigned in the worſhip paid to the ſame divinity by the inhabitants of the country, and eſpecially at the ſeaſon when they gathered the fruits of his beneficence. Vintagers, beſmeared with wine-lees, and intoxicated with joy and the juice of the grape, rode forth in their carts, and attacked each other on the road with groſs ſarcaſms, revenging themſelves on their neighbours with ridicule, and on the rich by publiſhing their injuſtice.

Anacharſis's Travels, vol. i.

Among the poets who flouriſhed at that time, ſome celebrated the great actions and adventures of gods and heroes, and others attacked with aſperity the vices and abſurdities of individuals. The former took Homer for their model, and ſupported themſelves by his example, of which they made an improper uſe. Homer, the moſt tragic of poets, the model of all who have ſucceeded him, had in the Iliad and the Odyſſey brought to perfection the heroic poem, and in his Margites had employed pleaſantry. But as the charm of his works depends in a great meaſure on the paſſions and motion with which he knew to animate them, the poets who came after him endeavoured to introduce into theirs an action which might excite emotion or mirth in the ſpectators: ſome even attempted to produce both, and ventured certain rude eſſays, which have ſince been ſtyled indifferently either tragedies or comedies, becauſe they unite the characters of thoſe two dramas. The authors of theſe ſketches have been diſtinguiſhed by no diſcovery; they only form in the hiſtory of the art a ſucceſſion of names which it would be uſeleſs to recal to light.

The neceſſity and power of theatrical intereſt was already known. The hymns in honour of Bacchus, while they deſcribed his rapid progreſs and ſplendid conqueſts, became imitative; and in the conteſts of the Pythian games, the players on the flute who entered into competition were enjoined by an expreſs law to repreſent ſucceſſively the circumſtances that had preceded, accompanied, and followed the victory of Apollo over Python.

Some years after this regulation, Suſarion and Theſpis, both born in a ſmall borough of Attica, named *Icaria*, appeared each at the head of a company of actors, the one on a kind of ſtage, the other in a cart (A). The former attacked the vices and abſurdities of his time; and the latter treated more noble ſubjects, which he took from hiſtory.

The comedies of Suſarion were in the ſame taſte with thoſe indecent and ſatirical farces which were afterwards performed in ſome of the cities of Greece. They were long the favourite entertainment of the country people. Athens did not adopt this ſpecies of exhibition until after it was brought to perfection in Sicily.

Theſpis had more than once ſeen in the feſtivals, in which as yet hymns only were ſung, one of the ſingers, mounted on a table, form a kind of dialogue with the chorus. From this hint he conceived the idea of introducing into the tragedies an actor who, by ſimple recitals introduced at intervals, ſhould give relief to the chorus, divide the action, and render it more intereſting. This happy innovation, together with ſome other liberties in which he had allowed himſelf, gave alarm to the legiſlator of Athens, who was more able than any other perſon to diſcern the value or danger of the novelty. Solon condemned a ſpecies of compoſition in which the ancient traditions were diſguiſed by fictions. "If we applaud falſehood in our public exhibitions (ſaid he to Theſpis), we ſhall ſoon find that it will inſinuate itſelf into our moſt ſacred engagements."

The exceſſive approbation and delight with which both the city and country received the pieces of Theſpis and Suſarion, at once juſtified and rendered uſeleſs the ſuſpicious foreſight of Solon. The poets, who till then had only exerciſed their genius in dithyrambics and licentious ſatire, ſtruck with the elegant forms which theſe ſpecies of compoſition began to aſſume, dedicated their talents to tragedy and comedy. Soon after a greater variety was introduced in the ſubjects of the former of theſe poems. Thoſe who judged of their pleaſures only from habit exclaimed, that theſe ſubjects were foreign to the worſhip of Bacchus; but the greater number thronged with ſtill more eagerneſs after the new pieces.

Phrynichus, the diſciple of Theſpis, made choice of that kind of verſe which is moſt ſuitable to the drama, was the author of ſome other changes, and left tragedy in its infancy.

Æſchylus received it from his hands enveloped in a rude veſtment, its viſage covered with falſe colours, or a maſk inexpreſſive of character, without either grace or dignity in its motions, inſpiring the deſire of an intereſt which it with difficulty excited, ſtill attached to the buffooneries which had amuſed its infant years, and expreſſing its conceptions ſometimes with elegance and dignity, but frequently in a feeble and low ſtyle, polluted with groſs obſcenities.

In his firſt tragedies he introduced a ſecond actor; and afterward, copying the example of Sophocles, who had juſt entered on his theatrical career, he admitted a third, and ſometimes even a fourth. By this multiplicity of perſonages, one of his actors became the hero of the piece, and attracted to himſelf the principal intereſt; and as the chorus now held only a ſubaltern ſtation, Æſchylus took care to ſhorten its part, and perhaps even carried this precaution too far.

He is cenſured for having admitted mute characters into his drama. Achilles, after the death of his friend, and Niobe, after the deſtruction of her children, appear

(A) Suſarion repreſented his firſt pieces towards the year 580 before Chriſt. Some years after, Theſpis made his firſt attempts in tragedy, and acted his Alceſtis in 536.

on the ſtage, and remain during ſeveral ſcenes motionleſs, with their heads covered with a veil, and without uttering a word; but if their eyes had overflown with tears, and they had poured forth the bitterest lamentations, could they have produced an effect ſo terrible as this veil, this ſilence, and this abandonment to grief?

It was not ſufficient that the noble and elevated ſtyle of tragedy ſhould leave in the minds of the auditors a ſtrong impreſſion of grandeur; to captivate the multitude, it was requiſite that every part of the ſpectacle ſhould concur to produce the ſame effect. It was then the general opinion that nature, by beſtowing on the ancient heroes a more lofty ſtature, had impreſſed on their perſons a majeſty which procured them as much reſpect from the people as the enſigns of dignity by which they were attended. Æſchylus therefore raiſed his actors on high ſtilts or buſkins. He covered their features, which were frequently diſagreeable, with a maſk that concealed their irregularity He clothed them in flowing and magnificent robes, the form of which was ſo decent, that the prieſts of Ceres have not bluſhed to adopt it. The inferior actors were alſo provided with maſks and dreſſes ſuited to their parts.

Inſtead of thoſe wretched ſcaffolds which were formerly erected in haſte, he obtained a theatre furniſhed with machines, and embelliſhed with decorations. Here the ſound of the trumpet was reverberated, incenſe was ſeen to burn on the altars, the ſhades of the dead to ariſe from the tomb, and the furies to ruſh from the gulfs of Tartarus. In one of his pieces theſe infernal divinities appeared, for the firſt time, with maſks of a horrid paleneſs, torches in their hands, ſerpents intertwined in their hair, and followed by a numerous retinue of dreadful ſpectres. It is ſaid that, at the ſight of them, and the ſound of their terrific howlings, terror ſeized on the whole aſſembly, women miſcarried, and children expired with fear; and that the magiſtrates, to prevent ſimilar accidents in future, commanded that the chorus ſhould conſiſt only of fifteen actors inſtead of fifty.

The effect of ſo many new objects could not but aſtoniſh the ſpectators; nor were they leſs ſurpriſed and delighted at the intelligence diſplayed in the performance of the actors, whom Æſchylus almoſt always exerciſed himſelf. He regulated their ſteps, and taught them to give additional force to the action by new and expreſſive geſtures.

The progreſs of the art was extremely rapid. Æſchylus was born 525 years before Chriſt, 11 years after Theſpis had acted his Alceſtis. He had for competitors Chœrilus Pratenas, and Phrynichus, whoſe glory he eclipſed, and Sophocles, who rivalled his own. Sophocles was born about the year 497 B. C. about 14 years before Euripides. Theſe carried tragedy to the higheſt perfection to which it attained among the Greeks. Æſchylus painted men greater than they can be, Sophocles as they ought to be, and Euripides as they are.

Invented towards the 50th Olympiad (about 580 B. C.), and adapted to the rude manners of the ruſtics, comedy ventured not to approach the capital; and if by chance ſome companies of actors, who were unconnected with any others, found their way into the city, and performed their indecent farces, they were leſs authoriſed than tolerated by the government. It was not till after a long infancy that this ſpecies of drama began ſuddenly to make a rapid improvement in Sicily. Inſtead of a ſucceſſion of ſcenes without connection or tendency, the philoſopher Epicharmus introduced an action, all the parts of which had a dependence on each other; and conducted his ſubject, without wandering from it, through a juſt extent to a determinate end. His pieces, ſubjected to the ſame laws as tragedy, were known in Greece, where they were conſidered as models; and comedy ſoon ſhared with her rival the ſuffrages of the public, and the homage due to genius. The Athenians, eſpecially, received her with the ſame tranſports as they would have teſtified at the news of a victory: many of their poets exerciſed their genius in this novel ſpecies of compoſition; and their names adorn the numerous liſt of writers who have been diſtinguiſhed in comedy from the time of Epicharmus. Such were, among the more ancient, Magnes, Cratinus, Crates, Pherecrates, Eupolis, and Ariſtophanes. They all flouriſhed in the age of Pericles.

If we peruſe the comic pieces which have come down to us, we ſhall be convinced that the ſole object of the authors was to pleaſe the multitude. The gods and heroes were traveſtied, groſs and obſcene language was often employed, and virulent invectives were often thrown out againſt individuals of the firſt rank for genius and virtue. Towards the end of the Peloponneſian war the licentiouſneſs of comedy was reſtrained. The chorus was laid aſide, becauſe the rich citizens were alarmed, and would no longer contribute money to ſupport it, nor provide maſks with portraits for expoſing individuals.

The poets being thus reſtrained from mentioning names of living perſons on the ſtage, invented falſe names. They ſtill expoſed real and known characters; and thus gave a more exquiſite gratification to the ſpectators, who were highly amuſed with finding out the perſons intended. The conſequence of the law was only to make that done with delicacy which was formerly done in the moſt indecent and ſcurrilous manner. Ariſtophanes, in ſome of his lateſt pieces, has given us ſome good examples of this kind of comedy, which is ſometimes called the middle comedy.

Comedy was ſtill liable to abuſe, and therefore required farther reformation. As the uſe of real names had formerly been prohibited, real ſubjects were alſo forbidden; and comedy from that time was no longer a fury armed with torches, or a firebrand ſcattering miſchief, but a pleaſing and inſtructive companion. This is called the new comedy. The moſt eminent among the Greeks in this improved ſpecies was Menander. His writings are now loſt; but we may form a good eſtimate of their merit from the comedies of Terence, which are ſaid to have been borrowed from Menander, and to have nearly reſembled the original, though inferior in that *vis comica* by which the elegant Grecian was diſtinguiſhed. The comedy of Menander is that which has been cultivated in modern times.

To give ſome idea of a Grecian theatre, we ſhall deſcribe very ſhortly the theatre of Bacchus in Athens, which was built by the famous architect Philos in the time of Pericles. The part intended for the ſpectators was of a ſemicircular form, at the diameter of which was erected the ſtage. The orcheſtra occupied the ſpace where the pit in modern theatres is ſituated, where the

Theatre.

the music, the chorus, and the mimi were placed. It was four feet elevated above the ground. The spectators were arranged in three galleries round all the sides of the orchestra except that next the stage, each gallery containing eight rows of seats. At the farther end of the orchestra, where the stage is erected in modern theatres, stood the thymele or logeon, but projecting a little towards the audience. It was a little higher than the orchestra, and did not extend the whole breadth of it. In some theatres it was only six feet square. Here the principal part of the chorus made their recitations, and in comical interludes the mimi performed. Behind the thymele appeared the stage or proscenion, considerably elevated. No part of this theatre was covered except the stage, and a high gallery called *circys* set apart for the women. The Athenians, being exposed to the weather, came usually with great cloaks, to secure them from the rain or the cold; and for defence against the sun, they had the *sciadion*, a kind of parasol, which the Romans used also in their theatres by the name of *umbellæ*; but when a sudden storm arose, the play was interrupted, and the spectators dispersed.

Gentleman's Magazine for 1760.

A sort of tent-work over the entire area of the edifice might have been contrived as a shelter from the rain and a shade from the sun. Such a covering would have obviated the inconveniences of roofed theatres, which obstruct the free communication of the air, and of unroofed theatres, which do not keep out the weather. At Athens the plays were always represented in the daytime, which made the unroofed theatres less inconvenient.

Plays were represented only during the three festivals solemnized in honour of Bacchus. The first of these was celebrated at the Piræus, where some of Euripides's pieces were first performed. The second, which lasted only one day, was kept at the end of January or beginning of February. The third, called the greater *Dionysia*, was celebrated a month after. It continued several days, and attracted a great multitude of spectators. In the festivals which lasted only one day, five or six dramatic pieces, either tragedies or comedies, were performed. But in the greater Dionysia, which continued longer, 12 or 15, and sometimes more, were acted. The performance began early in the morning, and sometimes lasted the whole day.

The chorus, according as the subject demanded, was composed of men and women, old men or youths, citizens or slaves, priests, soldiers, &c. to the number of 15 in tragedy, and 24 in comedy. The chorus came upon the stage preceded by a flute-player, who regulated their steps; sometimes one after the other, but in tragedy more frequently three in front and five in depth, or five in front and three in depth.

The same persons performed both in tragedy and comedy; but, as among ourselves, it was rare to meet with any who excelled in both. The pay of those who had acquired great reputation was considerable. Polus gained a talent in two days (equal to 27 l. sterling *). Players of eminence were solicited by different actors of Greece to attend their festivals. If, after making an engagement, they failed, they were obliged to pay a certain sum of money; and if they were absent during the festivals of their own republic, they were condemned to a heavy fine.

* *Plut. in X. Rhet.*

The actors had habits and symbols suited to their parts. Kings wore a diadem, leaned on a sceptre which supported an eagle on its top, and were dressed in long robes of purple or other splendid colours ornamented with gold. Heroes, besides having their stature frequently increased to six feet English †, and their bulk in proportion, were frequently covered with the skin of a lion or a tyger, and armed with swords, quivers, and clubs. All who suffered misfortunes wore a black, brown, or dirty white garment, which frequently hung in tatters. There were various kinds of masks for tragedy, comedy, and satire. These certainly took away the pleasure arising from the expression of the countenance; but at any rate, little pleasure could be derived from this circumstance in a Grecian theatre, from its immense size, and the great distance of the audience from the stage.

† *Arist. in Ran.* v. 1046. *Athen.* lib. v. cap. 7.

Dramatic entertainments were introduced at Rome in the year of the city 391. They were called *ludi scenici*, because they were first acted in a shade formed by the branches and leaves of trees. They were borrowed immediately from Etruria, whence also they received their first players. These Etrurians at first only danced to a flute, without either singing or acting. The Roman youth soon imitated them at their solemn festivals, adding raillery in rude verses, and gestures adapted to the subject. These verses were called *Fescennini*, from Fescennia, a city of Etruria. Livius Andronicus was the first poet who wrote a regular play in Latin. This happened in the year of Rome 512 or 514, about 160 years after the death of Sophocles and Euripides, and 52 after that of Menander. The Grecian model was afterwards introduced and cultivated much by succeeding dramatic writers. This was the model of Menander, for the old and middle comedy was unknown at Rome. As the Romans were only imitators of the Greeks in the dramatic art, as well as in most of the arts and sciences, nothing more is necessary to be said in addition to the account which we have already given of the Grecian stage.

The origin of the English stage is hid in obscurity. It was not, however, copied from the Grecian or Roman; for it was evidently different in form as well as in matter, and may with more propriety be deduced from a Gothic original. It appears that there were theatrical entertainments in England almost as early as the conquest; for we are told by William Stephanides or Fitz-Stephen, a monk, who in the reign of Henry II. wrote his *Descriptio Nobilissimæ Civitatis Londoniæ*, that "London instead of the common interludes of the theatre, had plays of a more holy kind; representations of the miracles of confessors, and the sufferings of martyrs. At this time there were also certain sets of idle people, who travelled the countries and were called *Mummers*, a kind of vagrant comedians, whose excellence consisted altogether in mimickry and humour.

Gentleman's Magazine for 1761.

It is probable that, soon after this time, the dramatic representations called *Mysteries* were exhibited: These mysteries were taken from scripture-history: some represented the creation of the world, with the fall of Adam and Eve; some the story of Joseph; and others even the incarnation and sufferings of the Son of God. These pieces were exhibited in a manner so ridiculous as to favour libertinism and infidelity, as appears by a petition of the chaunters of St Paul's cathedral to Richard II. in 1378, praying, that "some unexpert people might be

Cibber's Apology for his Life.

be prohibited from repreſenting the hiſtory of the Old Teſtament to the prejudice of the ſaid clergy, who had been at great expence to repreſent it publicly at Chriſtmas."

In the year 1390, the pariſh clerks of London are ſaid to have played interludes at Skinner's-well on three ſucceſſive days in July; and, in 1409, to have acted for eight days ſucceſſively a play concerning the creation of the world, at the ſame place which thence acquired the name of *Clerkenwell*.

Theſe Myſteries were ſucceeded by Moralities, in which there were ſome rude traces of a fable and a moral; and ſome alſo of poetry, the virtues, vices, and other affections of the mind being frequently perſonified.

After theſe Moralities came what were called Interludes, which made ſome approaches to wit and humour. Many of theſe pieces were written by John Heywood, jeſter to Henry VIII.

In the time of Henry VIII. one or two pieces had been publiſhed under the claſſical names of *Comedy* and *Tragedy*, but they appear not to have been intended for popular uſe. It was not till the religious ferments had ſubſided that the public had leiſure to attend to dramatic poetry. In the reign of Elizabeth, tragedies and comedies began to appear in form, and could the poets have perſevered, the firſt models were good. *Gorboduc*, a regular tragedy, was acted in 1561; and Gaſcoigne, in 1566, exhibited *Jocaſta*, a tranſlation from Euripides, as alſo *The Suppoſes*, a regular comedy, from Arioſto, near thirty years before any of Shakeſpeare's were printed.

Percy's Relics of Ancient Engliſh Poetry.

The people, however, ſtill retained a reliſh for their old myſteries and moralities, and the popular dramatic poets ſeem to have made them their models. The graver ſort of moralities appear to have given birth to our modern tragedy; as our comedy evidently took its riſe from the lighter interludes of that kind. And as moſt of theſe pieces contain an abſurd mixture of religion and buffoonery, an eminent critic has well deduced from thence the origin of our unnatural tragi-comedies. Even after the people had been accuſtomed to tragedies and comedies, moralities ſtill kept their ground. One of them, intitled *The New Cuſtom*, was printed ſo late as 1573. At length they aſſumed the name of *maſques*, and, with ſome claſſical improvements, became in the two following reigns the favourite entertainments of the court.

As for the old myſteries, which ceaſed to be acted after the reformation, they ſeem to have given riſe to a third ſpecies of ſtage exhibition; which, though now confounded with tragedy or comedy, was by our firſt dramatic writers conſidered as quite diſtinct from them both: theſe were hiſtorical plays, or hiſtories; a ſpecies of dramatic writing which reſembled the old myſteries in repreſenting a ſeries of hiſtorical events ſimply in the order of time in which they happened, without any regard to the three great unities. Theſe pieces ſeem to differ from tragedy juſt as much as hiſtorical poems do from epic: as the Pharſalia does from the Æneid. What might contribute to make dramatic poetry take this turn was, that ſoon after the myſteries ceaſed to be exhibited, there was publiſhed a large collection of poetical narratives, called *the Mirror for Magiſtrates*, wherein a great number of the moſt eminent characters in Engliſh hiſtory are drawn relating their own misfortunes. This book was popular and of a dramatic caſt; and therefore, as an elegant writer has well obſerved, might have its influence in producing hiſtoric plays. Theſe narratives probably furniſhed the ſubjects, and the ancient myſteries ſuggeſted the plan.

That our old writers conſidered hiſtorical plays as ſomewhat diſtinct from tragedy and comedy, appears from numberleſs paſſages of their works. "Of late days (ſays Stow in his Survey of London), inſtead of thoſe ſtage plays have been uſed comedies, tragedies, interludes, and hiſtories, both true and fained." Beaumont and Fletcher, in the prologue to the *Captain*, ſay,

"This is nor comedy, nor tragedy,
"Nor *hiſtory*."

Polonius in *Hamlet* commends the actors as the beſt in the world, either for tragedie, comedie, hiſtorie, paſtorall, &c. And Shakeſpeare's friends, Heminge and Condell, in the firſt folio edition of his plays, in 1623, have not only intitled their book "Mr William Shakeſpeare's Comedies, Hiſtories, and Tragedies," but, in their table of contents, have arranged them under thoſe three ſeveral heads; placing in the claſs of hiſtories, "King John, Richard II. Henry IV. two parts, Henry V. Henry VI. three parts, Richard III. and Henry VIII."

This diſtinction deſerves the attention of the critics: for if it be the firſt canon of ſound criticiſm to examine any work by thoſe rules the author preſcribed for his firſt obſervance; then we ought to try Shakeſpeare's hiſtories by the general laws of tragedy and comedy. Whether the rule itſelf be vicious or not, is another inquiry; but certainly we ought to examine a work only by thoſe principles according to which it was compoſed. This would ſave much impertinent criticiſm.

Not fewer than 19 playhouſes had been opened before the year 1633, when Prynne publiſhed his *Hiſtrio-maſtix*. From this writer we learn that tobacco, wine, and beer, were in thoſe days the uſual accommodations in the theatre, as now at Sadlers Wells. With regard to the ancient prices of admiſſion, the playhouſe called the *Hope* had five different priced ſeats, from ſixpence to half-a-crown. Some houſes had penny benches. The two-penny gallery is mentioned in the prologue to Beaumont and Fletcher's *Woman-hater;* and ſeats of three-pence and a groat in the paſſage of Prynne laſt referred to. But the general price of what is now called the *Pit* ſeems to have been a ſhilling. The time of exhibition was early in the afternoon, their plays being generally acted by day-light. All female parts were performed by men, no actreſs being ever ſeen on the public ſtage before the civil wars. And as for the playhouſe furniture and ornaments, they had no other ſcenes nor decorations of the ſtage, but only old tapeſtry, and the ſtage ſtrewed with ruſhes, with habits accordingly; as we are aſſured in a ſhort Diſcourſe on the Engliſh Stage, ſubjoined to Flecknoe's *Love's-Kingdom*, 1674, 12mo.

(B) For the ſtate of the theatre during the time of Shakeſpeare, ſee PLAYHOUSE; where a full account of it

(B) We have been anxious to give as full an account of the ancient Engliſh drama as we could: we muſt not omit,

Theatre.

it is given from the late valuable edition of our illustrious poet's works by Mr Malone. During the whole reign of James I. the theatre was in great prosperity and reputation: dramatic authors abounded, and every year produced a number of new plays; it became a fashion for the nobility to celebrate their weddings, birthdays, and other occasions of rejoicing, with masques and interludes, which were exhibited with surprising expence; our great architect, Inigo Jones, being frequently employed to furnish decorations, with all the luxuriance of his invention and magnificence of his art. The king and his lords, and the queen and her ladies, frequently performed in these masques at court, and the nobility at their private houses; nor was any public entertainment thought complete without them. This taste for theatrical entertainments continued during great part of the reign of King Charles I.; but, in the year 1633, it began to be opposed by the Puritans from the press; and the troubles that soon after followed entirely suspended them till the restoration of King Charles II. in 1660.

The king, at his restoration, granted two patents, one to Henry Killigrew, Esq. and the other to Sir William Davenant, and their heirs and assigns, for forming two distinct companies of comedians. Killigrew's were called the *King's Servants*, and Davenant's the *Duke's Company*. About ten of the company called the *King's Servants* were on the royal household establishment, having each ten yards of scarlet cloth, with a proper quantity of lace allowed them for liveries; and in their warrants from the lord chamberlain they were styled *gentlemen of the great chamber*.

Till this time no woman had been seen upon the English stage, the characters of women having always been performed by boys, or young men of an effeminate aspect, which probably induced Shakespeare to make so few of his plays depend upon female characters, as they must have been performed to great disadvantage. The principal characters of his women are innocence and simplicity, such are Desdemona and Ophelia; and his specimen of fondness and virtue in Portia is very short. But the power of real and beautiful women was now added to the stage; and all the capital plays of Shakespeare, Fletcher, and Ben Jonson, were divided between the two companies, by their own alternate choice, and the approbation of the court.

The king's servants seem to have been allowed to be the best company; and when the variety of plays began to be exhausted, they drew the greater audiences. Davenant, therefore, to make head against them, first added spectacle and music to action, and introduced a new species of plays, since called *dramatic operas;* among these were, *The Tempest*, *Psyche*, and *Circe;* which, with many others, were set off with the most expensive decorations of scenes and habits, and with the best voices and dancers.

In 1684 the two houses united, and continued together for ten years. In 1690 the play began at four o'clock; and, we are told, the ladies of fashion used to take the evening air in Hyde-park after the representation; by which it appears that the exhibitions were in summer too. The principal actors were, Betterton, Montfort, Kynaston, Sandford, Nokes, Underhill, and Leigh, commonly called *Tony Leigh;* the actresses were, Mrs Betterton, Barry, Leigh, Butler, Montfort, and Bracegirdle; and to this company, in this year, old Cibber was admitted as a performer in the lowest rank. It was a rule with the patentees, that no young person, who offered himself as an actor, should be admitted into pay till after at least half a year's probation; and Cibber waited full three quarters of a year before he was taken into a salary of 10s. a-week.

In 1695 a new theatre was opened with Mr Congreve's comedy of Love for Love, which had such extraordinary success (says Cibber) that scarce any other play was acted there till the end of the season; but when the season ended, which appears to have begun in June, he does not tell us, and it is indeed difficult to guess; for though the company acted in summer, it seems improbable that they should shut up the house in winter, as it is difficult to conceive any reason for so doing. Congreve was then in such high reputation, that this company offered him a whole share (but into how many shares the whole was divided Colley has not told us) upon condition he would give them a new play every year. This offer he accepted, and received the advantage, though he never fulfilled the condition; for it was three years before he produced the *Mourning Bride*, and three more before he gave them *the Way of the World*.

It is not necessary that we give in detail the remaining history of the English stage: those who are anxious to be acquainted with it may consult Cibber's history of the stage, continued by Victor, under the title of *A History of the Theatres of London and Dublin from the year* 1730. We shall only mention a few facts respecting the salaries of the players about that period, and the rise of the price of play tickets.

A difference having arisen in 1733 between the managers and actors, most of the actors set up for themselves at the little theatre in the Haymarket. Upon this the managers published the following account of their salaries, to show the public how little room they had to mutiny. To Mr Colley Cibber, from the time of letting his share till he left the stage, 12l. 12s. per week. Mr The. Cibber 5l. and his wife's whole salary till her death, without doing the company any service the greatest part of the winter; and his own also, during the time of his being ill, who performed but seldom till after Christmas. Mr Mills jun. 3l. under the same circumstances with regard to his wife. Mr Mills sen. 1l. per day for 200 days certain, and a benefit clear of all charges. Mr Johnston 5l. Mr Miller 5l. paid him eight weeks before he acted, besides a present of 10 guineas. Mr Harper 4l. and a present of 10 guineas. Mr Griffin 4l. and a present. Mr Shepard 3l. Mr Hallam, for himself and father (though the latter is of little or no service) 3l. Mrs Heron 5l. raised from 40s. last winter, yet refused to play several parts assigned her,

Gentleman's Magazine for 1733.

---

omit, however, to inform our readers what Mr Malone says of the old plays, viz. that not one play published before 1592 will bear a second reading; and that exclusive of mysteries, moralities, and translations, there are but 34 pieces extant which were published before that period.

Theatre || Thebes.

her, and acted but seldom this season. Mrs Butler 3l. per week. By these and other salaries, with the incident charges (besides clothes and scenes), the patentees are at the daily charge of 49l. odd money, each acting-day.

Till about the same time, the prices at the theatre were 4s. the boxes, 2s. 6d. the pit, 1s. 6d. the first gallery, and 1s. the second, except upon the first run of a new play or pantomime, when the boxes were 5s. the pit 3s. the first gallery 2s. and the second 1s. But Fleetwood thought fit to raise the prices for an old pantomime, which was revived without expence. This produced a riot for several nights, and at last a number deputed by the pit had an interview with the manager in the green room, where it was agreed, that the advanced prices should be constantly paid at the doors, and that such persons as did not choose to stay the entertainment should have the advanced part of their money returned. This was a very advantageous agreement for the manager; because, when the audience had once paid their money, and were seated, very few went out at the end of the play, and and demanded their advanced money; the few that did it at first, soon grew tired, and at last it settled in the quiet payment of the advanced price, as at this day.

It has been frequently a subject of debate, whether the stage be favourable to morals. We do not mean to enter into the controversy; but we shall make an observation or two. It will be allowed by all, that the intention of the players in acting, is to procure money; and the intention of the audience in attending the theatre, is to seek amusement. The players then will only act such plays as they believe will answer their intention. And what sort of plays are these? They are such as correspond with the opinions, manners, and taste, of the audience. If the taste of the audience be gross, therefore the plays will be gross; if delicate and refined, they will be the same. And if we go back to the time of Shakespeare, we shall find that this has been uniformly the case. The conclusion, then, which we draw, is this, if the taste of the audience be pure, free from licentiousness, the plays will be the same, and the stage will be favourable to virtue.

THEBAID, a celebrated heroic poem of Statius, the subject of which is the civil war of Thebes, between the two brothers Eteocles and Polynices; or Thebes taken by Theseus.

THEBES, the name of a celebrated city of ancient Greece. It is supposed to have been built by Cadmus, about the year of the world 2555. This Cadmus, according to the Greeks, was the son of Agenor king of Sidon or of Tyre; but the Sidonians allow him to have been of no higher quality than his cook, and tell us that his wife was a musician at court, with whom he ran away into Greece. The Greek writers tells us, that being commanded by his father to go in search of his daughter Europa, whom Jupiter in the shape of a bull had carried off, and forbid to return without her, he built, or rebuilt, the city of Thebes, after having long sought her in vain. He was at first opposed by the Hyantes and Aones; the former of whom he defeated in battle, and forced to retire into Locris; the latter submitted, and were incorporated among his subjects.

1 Account of Cadmus the founder of Thebes.

Those who endeavour to extract some truth from the multitude of fables in which the early part of the Grecian history is obscured, are of opinion that Cadmus was one of the Canaanites expelled by Joshua; and that he was of the family of the Cadmonites mentioned by Moses and Joshua. He is universally allowed to have introduced the Phœnician letters into Greece, set up the first schools, and introduced brass; which, from him, had the name of *Cadmean* given to it. The government of Thebes continued for a long time monarchical; and the names of a number of its kings have been transmitted to us, with some account of their transactions; but very much obscured by fable.

Thebes. 2 Supposed to be one of the exiled Canaanites.

Though the Thebans had been famed in the early period of their history for their martial atchievements, yet in process of time they seem to have degenerated. At the time of the invasion of Xerxes, they were the first people in Greece who were gained over to the Persian interest. On account of this conduct, they became very obnoxious to the other states, especially to the Athenians, whose power and renown increased every day, and threatened at last to swallow them up altogether. The Thebans being in no condition to oppose such a formidable power, put themselves under the protection of the Spartans, who, out of jealousy of the Athenians, readily forgave them; and so grateful were the Thebans for the kindness shown them at this time, that during the whole of the Peleponnesian war Sparta had not a more faithful ally. By these means they not only recovered the government of Bœotia, of which they had been formerly in possession, till deprived of it on account of their siding with the Persians, but their city became one of the first in Greece. By this prosperity the Thebans were so much elated, that, when the peace of Antalcidas came to be signed, they refused to agree to it, as they were thus once more deprived of the government of Bœotia; so that it was not without the utmost difficulty that they were overawed into it by the other states. Not content with forcing them to give up this point, however, the Spartans undertook to change the form of the Theban government, which at this time was a democracy, and accomplished through the treachery of those who had the care of the citadel.

3 The Thebans a degenerate stupid people.

4 Put themselves under the protection of the Spartans.

5 The form of government changed, and the citadel seized by the Spartans.

The Thebans continued under the power of the Spartans for four years; at the end of which term a conspiracy being formed against them by some of the principal people in the city, among whom was a young nobleman named *Pelopidas*, the Spartans were massacred and driven out, and the citadel regained. During the tumult Epaminondas, afterwards the celebrated general, with a number of the best citizens, joined the party of Pelopidas; and the latter having called a general assembly of the Thebans, proclaimed liberty to them, and exhorted them in the strongest manner to fight for their country. This speech was received with the greatest acclamations; Pelopidas was unanimously proclaimed the preserver of Thebes, and was charged with the management of the war which was then to be declared against Sparta.

6 The Thebans recover their liberty under Pelopidas.

These transactions so much exasperated the Spartans, that they immediately sent their king Cleombrotus against them, though it was then the depth of winter. The Athenians, in the mean time, who had hitherto assisted the Thebans, declined any farther connection, lest they should draw upon themselves the resentment of the

7 War with Sparta.

Thebes.

the Spartans. But they were ſoon after determined to act again on the ſame ſide, by an attempt which the Spartan general, Sphodnas, had raſhly made on the Pyræus or harbour of Athens. Thus, by means of the Athenians, a powerful diverſion was made in favour of the Thebans, who gradually recovered all the towns of Bœotia, and at length began to act offenſively againſt their enemies, and made a powerful invaſion in Phocis. They had now many ſharp encounters with them; which, though they did not amount to deciſive battles, yet did not fail to raiſe their courage, and depreſs that of the Spartans. In theſe encounters Pelopidas always ſignalized himſelf; and in the battle of Tanagra, where the Lacedemonians were entirely defeated by the Athenians and their allies, Pelopidas had a principal ſhare in the victory, and killed the Spartan general with his own hand. Soon after this, with a body of only 300 Thebans, he entirely routed and diſperſed near 1000 Spartans; which was the greateſt diſgrace the latter had ever known; for till that time, whether in war with the Greeks or barbarians, they had never been overcome by an equal, much leſs by ſuch an inferior, number of troops.

8 The Spartans defeated by Pelopidas.

Theſe ſucceſſes of the Thebans greatly alarmed the Athenians, who continually ſought to oppoſe their growing power. In this oppoſition they were joined by the Platæans, who on this account became extremely obnoxious to the Thebans, ſo that they at laſt came to a reſolution to ſurpriſe their city. This they accompliſhed, and entirely deſtroyed it, together with Theſpia, another city extremely well affected to Athens. Soon after this, the Thebans, encouraged by their ſucceſs, began to think of enlarging their territories, and of making encroachments on their neighbours, as they ſaw other ſtates had done before them. This ſpirit of conqueſt is ſaid to have been raiſed by their general Pelopidas; in which he was ſeconded by Epaminondas, a perſon who, though like him endowed with all the neceſſary qualities to make a complete captain or patriot, had till then preferred a private life, and lived in a conſtant courſe of virtue and the ſtudy of philoſophy. He had as yet ſeldom appeared in public, except to get himſelf excuſed from thoſe ſtate employments which were ſo eagerly courted by others. This, however, had not hindered him from contracting an intimate friendſhip with Pelopidas, which had been daily improved by the correſpondence of their tempers and principles, as well as by that zeal which both diſplayed for the good of their country; which laſt had made them, even before this time, appear together in action, and to ſuch advantage, that Epaminondas's merit could be no longer concealed, nor indeed ſuffer him to continue longer in his beloved retirement: ſo that he ſaw himſelf, at length deſervedly placed at the head of the Theban troops; where he gave ſuch early proofs of his future proweſs and abilities, as juſtly gave him the next rank to Pelopidas. Both came now to be conſidered in the ſame light, as generals in the field, as governors at home, and as complete ſtateſmen in the council. When the general treaty for reſtoring peace to Greece came to be propoſed by the Athenians, and was upon the point of being executed by the reſt of the ſtates, the Thebans refuſed to agree to it, unleſs they were comprehended in it under the name of *Bœotians*. This demand was as ſtrenuoſly oppoſed by the other contracting powers as

9 Platæa and Theſpia razed by the Thebans.

10 Account of Epaminondas.

Thebes.

insiſted on by Epaminondas, who was there as ambaſſador on the part of the Thebans. Ageſilaus, in particular, told him in plain terms, that the Thebans ought to evacuate Bœotia, and leave the cities of it free and independent. To which it was anſwered by him, that the Lacedemonians would do well to ſet them the example, by reſtoring Meſſenia to its ancient proprietors, and Laconia to its ancient freedom; for that the pretenſions of the city of Thebes to Bœotia were as well founded, at leaſt, as thoſe of Sparta to thoſe two countries. After this he went on, and ſhowed how far Sparta had aggrandized herſelf at the expence of her neighbours: that peace might be indeed obtained, and upon a ſolid and laſting footing; but that this could not otherwiſe than by bringing all to an equality. This bold though juſt remonſtrance, in which not only Thebes, but Greece in general was concerned, failed not, however, to exaſperate the haughty Spartan monarch; and the Athenians, who had till now looked upon the Thebans as dependents either on them or on the Macedonians, were not a little offended to hear their ambaſſadors talk in ſuch high terms. The reſult of the conference was, that Ageſilaus ſtruck the name of *Thebes* out of the treaty, and declared war againſt them, about the year 371 B. C.

11 His difference with Ageſilaus king of Sparta.

The Thebans were in no ſmall conſternation to ſee themſelves engaged in a war with the powerful Spartans, without any ally to aſſiſt them; and the reſt of the Grecian ſtates having made peace with the latter, began to look upon the ruin of the former as unavoidable. However, they reſolved to make the beſt defence they could; and put their army under the command of Epaminondas, aſſigning him, at his own requeſt, ſix others to act as counſellors or aſſiſtants. The Theban army conſiſted at moſt but of 6000 men, whereas that of the enemy was at leaſt thrice that number; but Epaminondas truſted moſt to his horſe, wherein he had much the advantage both in quality and good management: the reſt he endeavoured to ſupply by the diſpoſition of his men, and the vigour of the attack. He even refuſed to ſuffer any to ſerve under him in the engagement, but ſuch as he knew to be fully reſolved to conquer or die. The two armies met at Leuctra, where the Spartans were defeated with great ſlaughter, as related under that article.

12 The Spartans declare war againſt Thebes.

13 Are entirely defeated at Leuctra.

The victorious general, deſirous to improve this great victory, ſent an herald, crowned with garlands, to communicate it in form to the Athenians, in hopes that this would be an effectual means to reunite them to the Theban intereſt. But it proved quite otherwiſe. Athens, which now looked upon them with a jealous eye, and had then in view the ſovereignty of Greece, choſe rather, if they could not wholly obtain it, to ſhare it with Sparta, than to let the Thebans into the whole; and therefore even declined giving their herald audience. However, the Thebans took care to ſtrengthen themſelves by alliances; and, beſides the Arcadians and Eleans, had got the Phocians, Locrians, Acarnanians, Eubœans, and other ſtates, under their dependence: ſo that they were now in a condition to act offenſively againſt the Spartans. Accordingly, under pretence of aſſiſting the Arcadians, they entered Peloponneſus with a gallant army, with Epaminondas and Pelopidas at their head. Here they were joined by the Arcadian and other confederate forces; ſo that the whole amounted to 40,000, ſome

14 The Athenians jealous of the Thebans.

15 The Thebans invade Peloponneſus with a formidable army, but are repulſed.

Thebes.

some say 50,000 men, besides great numbers of those who followed the camp, rather for plunder than fighting, and were computed about 20,000 more. The army was divided into four columns, and moved straight towards Sellasia, the place of rendezvous, from which they pursued their journey with fire and sword towards Sparta. But here they were repulsed by Agesilaus, who was then returned to that metropolis.

To repair, in some measure, this disgrace, and at the same time to leave some lasting monument which should redound as much to his glory as to the mortification of the Spartans, Epaminondas left not their territories till he had restored the posterity of the old Messenians to their ancient dominions, out of which they had been banished near 300 years; rebuilt their capital, and left a strong garrison for its defence. He was, however, nearly cut off in his return by Iphicrates, whom the Athenians had sent with 12,000 men to intercept him; but this last loitered so long at Corinth, that the Thebans had passed the defiles of Cenchreæ, the chief place where he could have obstructed his retreat had he taken possession of it in proper time. Epaminondas continued his march till he came in full view of the city of Corinth. He found the roads choaked up with trees, rocks, stones, and every thing that could render them impassable; and the Corinthians well fortified, and resolute on a stout defence. But he came so furiously upon them, notwithstanding all these difficulties, that they abandoned all their entrenchments and outworks to the Thebans, and fled into the city. Thither these pursued them sword in hand, and made an horrid slaughter of them; insomuch that Corinth must have unavoidably fallen into their hands, had their generals thought fit to pursue these advantages; but whether they were afraid of the Athenians falling upon them, or apprehended some dangerous ambush in a country with which they were but indifferently acquainted, or whether the army was too much weakened through so many fatigues, or lastly, whether the coldness of the season, it being then the depth of winter, would not permit them to proceed farther, they immediately marched towards Bœotia. This gave such an advantage to their enemies, that they met with a very mortifying reception at their return to Thebes, where they were both arrested, and seized as state-prisoners, for having presumed to prolong their command four months longer than the time limited by law, which time took in almost the whole of their expedition from their first entrance into Peloponnesus. However, at last, the judges being ashamed to proceed any farther, they were both honourably acquitted.

16 The Messenians restored to their ancient dominions.

17 The Corinthians defeated.

18 Epaminondas and Pelopidas disgraced at Thebes.

This prosecution had been chiefly carried on and encouraged by Meneclides, a discontented Theban, and a bold and able speaker, who, by his artful calumnies at the trial, had so far prevailed with the judges as to get Epaminondas deprived of the government of Bœotia for a whole year, though he could not gain the same advantage against Pelopidas, who was a greater favourite of the people, as being his senior.

By this delay the Spartans, with much difficulty, had recovered themselves from their great defeat at Leuctra, and settled their affairs in as good a posture as they could; but though they had repulsed the Thebans in Peloponnesus, yet from the exploits they had performed there, especially in the dismembering the whole kingdom of Messenia from them, they had still cause to fear what their forces might do under two such generals; and had accordingly taken due care to strengthen themselves against them, and to provide themselves with a great number of auxiliaries from other states, especially from that of Athens, with whom they had renewed their old treaty, and had agreed that each should have the command five days alternately. Soon after this treaty the Arcadians renewed the war, and took Pallene in Laconia by storm, put the garrison to the sword, and were presently assisted by the Argives and Eleans, and especially by the Thebans, who sent to them 7000 foot and 500 horse under the command of Epaminondas. This so alarmed the Athenians likewise, that they immediately sent Gobrias with some forces to oppose his passage in good earnest; and he so behaved himself against the Thebans, that they were forced to abandon Peloponnesus a second time. This ill success gave fresh occasion to the enemies of Epaminondas to blame his conduct in the highest terms, notwithstanding the singular bravery with which he and his troops had forced the pass. Even his friends could not but suspect him of partiality for the Spartans, in not pursuing his advantage over them, and making a greater slaughter of them when he had it in his power; whilst his enemies made it amount to no less than treachery to his country: so that their brave general was once more deprived of the government of Bœotia, and reduced to the condition of a private man. He did not continue long under this disgrace, before an occasion offered to make his services again of such necessity to the state, as to give him an opportunity to retrieve his fame, and wipe off the stain which his enemies had thrown upon him.

19 War renewed with Sparta.

20 The Thebans repulsed.

21 Epaminondas degraded.

The Thessalians, who had groaned some time under the tyranny of the usurper Alexander, surnamed the *Pheræan*, sent an embassy to Thebes to implore their aid and protection; upon which Pelopidas was immediately sent as ambassador to expostulate with him on their behalf. He was then in Macedon, from whence he took the young prince Philip, afterwards the celebrated monarch, in order to protect and educate him; and, upon his return, marched directly to Pharsalus in Thessaly, in order to punish the treachery of some mercenaries, who had deserted the Thebans in that expedition; but when he came thither, he was surprised to be met by the tyrant at the head of a numerous army before that city, whilst his own was but as an handful of men in comparison of it. However, whether he supposed, or would be thought to do so, that Alexander came thither to justify himself, and answer to the complaints alleged against him, he went, with Ismenias his colleague, to him unarmed and unattended, not doubting but his character as ambassador from so powerful a republic, joined to his own character and authority, would protect them from insult or violence: but he found himself mistaken; for Alexander had no sooner got them into his hands, than he caused them to be seized, and sent prisoners to Pheræa.

22 Pelopidas seized by Alexander of Pheræa.

The Thebans, highly resenting the indignity offered to their ambassadors, sent immediately an army into Thessaly: but the generals were repulsed with great loss by the Pheræan usurper; and it was owing to Epaminondas, who was among them only as a private centinel, that they were not totally cut off. For the Thebans, finding

23 A Theban army sent to rescue him, defeated.

Thebes.

finding themſelves in ſuch imminent danger, which they attributed to the incapacity of their generals, had immediately recourſe to him, whoſe valour and experience had been ſo often tried; and, partly by perſuaſions and intreaties, and partly by threats, obliged him to take the command. This ſoon gave a different turn to their affairs, and converted their flight into a ſafe and regular retreat; for he took the horſe and light-armed foot, and placed himſelf at their head in the rear, and charged the enemy with ſuch vigour and bravery, that he obliged them to deſiſt from their purſuit.

24 Epaminondas restored.

However, as the army had ſuffered ſuch loſs before as not to be able to purſue them in their turn, he was obliged to return with them to Thebes, with their puſillanimous generals; where the latter were fined 12,000 drachms each, and the former was reinſtated in the command, and ſent with a new reinforcement to repair the late diſhonour, and proſecute their revenge. The news of his being in full march on this errand greatly alarmed the tyrant; but Epaminondas, preferring the ſafety of his impriſoned colleague to all other conſiderations, forbore puſhing hoſtilities to extremes, for fear of provoking the enemy to wreak all his fury on him: to prevent which, he contented himſelf for a while hovering about with his army, and now and then with ſuch ſlight ſkirmiſhes as ſhould intimidate the tyrant, and bring him the ſooner to make ſome ſatisfactory offers. Alexander being fully convinced of the ſuperiority of the Theban general, was glad to accept of a truce of 30 days, and to reſtore Pelopidas and Iſmenias to him; upon which he immediately withdrew his forces, and returned with them to Thebes.

25 Rescues Pelopidas.

By this time Thebes was raiſed to a ſufficient height of reputation and glory to begin to aim in earneſt at the ſovereignty of Greece. The main obſtacle to it was, that the other ſtates grew ſo jealous of her preſent greatneſs, as to enter into the ſtrongeſt alliances and confederacies to prevent its farther growth; ſo that not being able now to procure many allies at home, they made no difficulty to ſeek for them abroad; and the Lacedæmonians, by leading the van, gave them a plauſible pretence to follow their ſteps, and procure an alliance with Perſia, which at that time they found was ready to accept of the offers on any terms; the only queſtion was, which of the three ſtates ſhould be preferred, Sparta, Athens, or Thebes. At the ſame time, the Thebans propoſed to their new confederates to ſend likewiſe proper deputies to the Perſian court, in order to ſupport their reſpective intereſts; which they readily agreed to. Theſe were the Arcadians, Eleans, and Argives; at the head of whoſe deputation Pelopidas was ſent on the behalf of the Thebans; which the Athenians being appriſed of, appointed two on their part. Theſe being all arrived at the Perſian court, began to purſue each their reſpective intereſts; but Pelopidas had by that time gained ſuch credit there, both for his ſingular addreſs and his extraordinary exploits, that he was diſtinguiſhed in a particular manner from all the other deputies, and was received by the king with manifeſt marks of honour and eſteem, who freely owned himſelf convinced that the Thebans were the people on whom he could moſt ſafely depend; and after having greatly applauded the equity of his demands, ratified and confirmed them with great readineſs, to the no ſmall mortification of the other ſtates. The ſubſtance of them was, that the liberties formerly granted to the other towns of Greece ſhould be confirmed; that Meſſenia, in particular, ſhould continue free and independent on the juriſdiction of Sparta; that the Athenians ſhould lay up their fleet; and that the Thebans ſhould be looked upon as the ancient and hereditary friends of Perſia.

26 Success of Pelopidas at the Persian court.

Thebes.

The Thebans took advantage of the diſſenſions which prevailed among the Greeks as a pretence for increaſing their forces; and Epaminondas thought it a proper opportunity for his countrymen to make a bold effort to obtain the dominion at ſea, as they had obtained it in a great meaſure at land. He propoſed it to them in a public aſſembly, and encouraged their hopes from the experience of the Lacedemonians, who in Xerxes's time had, with ten ſhips only at ſea, gained the ſuperiority over the Athenians, who had no fewer than 200; and added, that it would be a diſgrace now to Thebes to ſuffer two ſuch republics to engroſs the empire of ſo extenſive an element, without putting in at leaſt for their ſhare of it. The people readily came into his propoſal, not without extraordinary applauſe, and immediately ordered 100 galleys to be equipped; and in the mean while ſent him to Rhodes, Chios, and Byzantium, to ſecure thoſe ſtates in their intereſt, and get what aſſiſtance he could from them. His negotiations had all the ſucceſs that could be wiſhed for, notwithſtanding the ſtrenuous oppoſition of the Athenians, and of their admiral Laches, who was ſent with a powerful ſquadron againſt him. But what more effectually thwarted all his meaſures, was the work that they found for him at land, and the obliging the Thebans to take part in the quarrels that then reigned among their neighbours: ſo that whatever projects they had concerted, proved abortive for the preſent; and the death of Epaminondas, which happened not long after, put an effectual ſtop to them.

27 The Thebans propose to build a fleet.

During the abſence of that general, and of his colleague Pelopidas, the Orchomenians, being ſpirited up by ſome Theban fugitives, had formed a deſign to change the Theban government into an ariſtocracy; and 300 horſemen of the former had been actually ſent to put it in execution. Their project, however, was timely diſcovered by the vigilance of the magiſtrates, who cauſed them to be ſeized, and put immediately to death. They next ſent a ſufficient force againſt the city of Orchomenos, with orders to put all the men to death, and to ſell the women and children for ſlaves, which was punctually done; after which they razed that noble city to the ground. Pelopidas was then on his way to Theſſaly, at the head of a powerful army, whither he had been ſent to aſſiſt the Theſſalians, who ſtill groaned under the tyranny of Alexander the Pheræan, and had made ſeveral brave efforts to recover their liberty, but had been ſtill overpowered by that uſurper. Being joined by the Theſſalians, he encamped in the face of the enemy, though far ſuperior in number, and conſiſting of above 20,000 men. A fierce engagement ſoon enſued, in which both ſides fought with uncommon bravery. The place where the battle was fought was called *Cynocephala*, from ſeveral little hills on it, between which there ran a large plain. Both ſides endeavoured at firſt to poſt themſelves on theſe eminences with their foot, whilſt Pelopidas ordered his cavalry to charge that of the enemy below; which they did with ſuch ſucceſs, that they ſoon put them to the rout, and purſued them over the plain. This obliged the tyrant to gain the tops of the hills, where he

28 The city of Orchomenos razed.

29 Pelopidas marches against the Theſſalian tyrant.

Thebes.

greatly annoyed the Theſſalians that endeavoured to force thoſe aſcents; ſo that Pelopidas was obliged to give over his purſuit to come to their relief. This immediately inſpired the Theſſalians with freſh courage, who began again to charge the enemy at ſeveral onſets; and ſoon threw them into ſuch diſorder, that they were forced to give way. Pelopidas no ſooner perceived the advantage, than he began to look about for Alexander, with a deſign of engaging him. Having found him out as he was commanding his right wing, and endeavouring to rally his men, he moved directly to him; and being got near enough to be heard by him, challenged him to decide the battle by ſingle combat with him. Alexander, inſtead of accepting the offer, turned about, and with all the ſpeed he could ran to ſcreen himſelf amongſt his guards. Upon this Pelopidas charged him with ſuch furious ſpeed, that he obliged him to retire farther, and ſhelter himſelf within the thickeſt ranks; the ſight of which made him attack with freſh vigour, and fight more deſperately againſt him. He tried in vain ſeveral times to break through their ranks to reach him, cutting down great numbers of thoſe that came forward to oppoſe him: his eagerneſs at length expoſed him ſo far to the darts that were ſhot at him at a diſtance, that ſome of them went quite through his armour, and gave him a deſperate wound or two, while the reſt advanced and ſtabbed him in the breaſt with their ſpears.

30 Is killed.

It is ſcarcely poſſible for words to expreſs the grief and deſpair which not only his brave Thebans, but likewiſe the Theſſalians and other allies, ſhowed at the ſight of their ſlain general: ſome of the latter, who had perceived the danger he was expoſed to, came down the hill with all poſſible ſpeed to his relief; but when they perceived that they were come too late to ſave him, both they and the reſt of the little army thought on nothing now but to revenge his death. They rallied accordingly, both horſe and foot, as quick as poſſible, and began to charge the enemy afreſh, and with ſuch deſperate fury, that they at length gained a complete victory over them, and killed above 3000 of them in the purſuit, beſides a much greater number which they had ſlain on the field of battle, though they ſtill looked upon all theſe advantages as vaſtly too ſmall to compenſate the loſs of their brave general.

31 Alexander defeated,

The news of his death had no ſooner reached Thebes, than the whole city was ſeen in as deep a mourning as his army. However, they ſent a reinforcement to it of 7000 foot and 700 horſe, as well to revenge the death of that general, as to improve the victory he had gained over the enemy; by the help of which they fell ſo furiouſly on them, that they quickly broke and totally defeated the ſhattered remains of Alexander's army. Hereupon he was forced to ſue for peace, and to accept it on ſuch conditions as the conquerors thought fit to impoſe. He was at length diſpatched in his bed by his wife Thebe, aſſiſted by her brothers, about ſeven years after his defeat. His body was afterwards dragged along the ſtreets, trodden under foot, and left a prey to the dogs.

32 and at laſt murdered.

33 Ambition of the Thebans.

All this while the Thebans were watching to improve every commotion that happened, every ſucceſs they met with, to the forwarding of their then reigning and favourite project, of increaſing their power above all the reſt, and in their turn to give laws to Greece. Their late ſucceſs in Theſſaly, and the rupture between the Arcadians and Mantineans at the ſame time, about ſome conſecrated money which the former had taken out of the temple of Olympias to pay their troops employed againſt the Eleans, and which the latter called a downright ſacrilege, beſides other diſcords that reigned in the other ſtates of Greece, gave freſh encouragement to Thebes to ſet up for arbitreſs in thoſe diſputes; and ſo much the more, as thoſe who had embezzled the ſacred money, and wanted rather to embroil matters than to have them brought to light, ſent that republic word that the Arcadians were juſt upon the point of revolting to the Spartans, and adviſed them to come and put an immediate ſtop to it. At the ſame time they diſpatched ſome private directions to a Theban officer at Tegea, to apprehend ſeveral of their own people as diſturbers of the peace. This was accordingly done, and ſeveral eminent perſons were confined as priſoners of ſtate: they were ſoon after diſcharged, and loud complaints were made againſt ſuch arbitrary and unjuſt proceedings. The officer was accuſed before the Theban ſenate of having intermeddled in their affairs, and endeavoured to interrupt the good correſpondence betwen the two ſtates. It was even inſiſted on by ſome of the Tegeans, that he ſhould be indicted and proceeded againſt by his principals; whilſt the more moderate ſort, who foreſaw the conſequences that were likely to attend ſuch appeals, and that it would infallibly bring the Thebans upon them, loudly proteſted againſt their marching into their territories, and did all they could to prevent it. The Thebans, however, were become too powerful and ambitious to miſs ſo fair an opportunity of getting once more footing in Peloponneſus, as they had long ago premeditated; and Epaminondas was ſo far from making a ſecret of their deſign, that he told the Arcadian deputies in juſtification of it, that as it was on their account that the Thebans engaged in the war, they had acted treacherouſly with them in making peace with Athens without their conſent: however, that when he had joined his army on his march into Peloponneſus to aſſiſt his friends, he would ſoon ſee what proofs the Arcadians would give of their fidelity. This ſpeech did not fail to alarm them greatly; eſpecially as it was ſpoken in ſuch a magiſterial ſtyle and threatening tone. Even thoſe who were beſt affected to the Thebans could not forbear expreſſing their diſlike of it; and all that had the welfare of Peloponneſus at heart readily agreed with the Mantineans, that there was no time to be loſt to uſe all proper means to prevent the impending ſtorm.

34 Epaminondas diſpleaſes the ſtates of Greece.

Athens and Sparta were accordingly applied to, and were eaſily prevailed upon to aſſiſt the Mantineans, and to come into a ſtrict confederacy againſt the Thebans; and to prevent all diſputes about the command of the army, it was agreed that each ſtate ſhould have it in its own territories; which plainly ſhows how terrified they all were at the apprehenſion of a freſh invaſion of the Thebans: for this was a point which neither the Spartans nor Athenians would have ſo readily given up to the Arcadians, though theſe had formerly as ſtrenuouſly inſiſted upon it, even when they were almoſt reduced to the laſt extremity, and had never been able to obtain it till now. But Epaminondas was then in full march at the head of his Bœotian troops, with ſome Eubœan auxiliaries, and a body of ſtout Theſſalian horſe; and was moreover to be joined by the Meſſenians, Argives, and ſeveral

35 A combination againſt Thebes.

Thebes.

several other nations, as soon as he had entered Peloponnesus. The confederate army against him had ordered their rendezvous at Mantinea, the place which they naturally concluded would be first attacked, as being the chief seat of those who had revolted from the Thebans. But whilst they were securing themselves on that side, Epaminondas, who wisely considered how far this confederacy and expedition must have drained the city of Sparta of its main strength, broke up privately from Nemæa, where he had lain for some time encamped, and marched all that night with a design to have surprised that important capital: but his project being timely discovered, the vigilant king took care to disconcert it; so that, though the Theban general made several vigorous assaults on that city, he was so stoutly repulsed, and the Spartans behaved with such intrepid valour, that he was forced to retire and turn his thoughts against Mantinea, which he judged by this time to have been quite defenceless. He judged rightly indeed; for the place was not only drained of its troops, but likewise of its inhabitants, who took that opportunity, whilst the scene of war was in Lacedemon, to gather in their harvest, and were scattered all over the country; so that he would not have met with any difficulty in gaining the town, had not the Athenian auxiliaries come unexpectedly to its relief, and given him a fresh repulse.

36 Epaminondas makes an unsuccessful attempt on Sparta,

37 and on Mantinea.

These two last defeats greatly exasperated the Theban general, who had never before experienced such disasters, and could not but foresee that they would not only lessen his reputation with his allies, but, if not timely retrieved, would sully the glory of all his former exploits. What added to his present difficulties was, that the time allotted him for his expedition was almost expired; so that he had but a short space left to undertake some brave atchievement, which might recover his and his country's honour, and keep up the spirits of his auxiliaries and those under his protection. He was moreover got very far into his enemy's country, and saw plain enough how narrowly they watched all his motions, and how well prepared they were to oppose him whatever attempt he resolved upon, whether to attack them or to retreat. Under all these difficulties, he rightly considered, that he must immediately resolve upon a decisive battle; in which, if his pristine fortune followed him, he might at once retrieve his affairs, and make himself master of Peloponnesus; or, if that failed him, as it lately had done, fall honourably in the attempt. In this engagement Epaminondas made the wisest disposition of his troops, attacked and fought with the most intrepid courage and conduct, and had opened himself a way through the Spartan phalanxes, thrown them into the utmost confusion, and made a terrible slaughter of them, insomuch that the field of battle was covered with their wounded and slain, when, in the heat of the fight, having ventured himself too far in order to give them a total overthrow, the enemy rallied again, pouring with their whole fury three volleys of darts at him, some of which he drew out and returned to them, till at length, being covered with wounds, and weakened with the loss of so much blood, he received a mortal wound from a javelin, and was with great difficulty rescued from the enemy by his brave Thebans, and brought alive, though speechless, into his tent. As soon as he had recovered himself, he asked his friends that were about him what was become of his shield; and being told that it was safe, he beckoned to have it brought to him, and kissed it. He next inquired which side had gained the victory; and being answered, The Thebans; he replied, Then all is well: and upon observing some of his friends bewail his untimely death, and leaving no children behind him, he is said to have answered, Yes; I have left two fair daughters, the victory of Leuctra, and this of Mantinea, to perpetuate my memory. Soon after this, upon drawing the point of the javelin out of his body, he expired.

38 Battle of Mantinea.

39 Epaminondas killed.

Thebes.

The consequence of this great general's fall, and of this bloody fight in which neither party could boast any great advantage over the other, but a great loss of men on both sides, insomuch that Xenophon makes it a drawn battle, was, that both parties agreed on a cessation of arms, and parted, as it were by consent, to take care of their wounded and slain. The Thebans indeed thus far gained the greater share of glory, that they renewed the fight, and after a most desperate contest, gained the victory over those Spartans that opposed them, and rescued the body of their dying general out of their hands. However, an effectual end was put to this bloody war, and a general peace agreed on by all but Sparta; who refused it only because the Messenians were included in it. But as to the Thebans, they had no great reason to boast of this dear-bought victory, since their power and glory began to decline from that very time; so that it may be truly said, that it rose and set with their great general.

40 Peace concluded.

On the death of Epaminondas, the Thebans relapsed into their former state of inactivity and indolence; and at last having ventured to oppose Alexander the Great, their city was taken, and the inhabitants slaughtered for several hours, after which the buildings were destroyed. It was rebuilt by Cassander, but never afterwards made any considerable figure among the states of Greece. About the year 146 B. C. it fell under the power of the Romans, under which it continued till the extinction of their empire by the Turks. It is now called *Thive*, and is nothing to what it was formerly; yet it is four miles in circumference, but so full of the ruins, that there are not above 4000 Turks and Christians in it. It is now famous for a fine fort of white clay, of which they make bowls for pipes after the Turkish fashion. They are never burnt, but dry naturally, and become as hard as a stone. There are two mosques in Thebes, and a great many Greek churches. It is seated between two small rivers, in E. Long. 23. 40. N. Lat. 38. 17.

41 State of Thebes to the present time.

THEBES, in Egypt, one of the most renowned cities of the ancient world. It was also called *Diospolis*, or the city of Jupiter, and was built, according to some, by Osiris, according to others by Busiris. Its length, in Strabo's time, was 80 furlongs, or ten miles; but this was nothing in comparison of its ancient extent, before it was ruined by Cambyses, which, we are told, was no less than 420 stadia, or 52 miles and an half. The wealth of this city was so great, that, after it had been plundered by the Persians, what was found, on burning the remains of the pillage, amounted to above 300 talents of gold and 2300 of silver.

Ancient Universal History. vol. i.

Mr Bruce visited the ruins of this celebrated city; but informs us that nothing now remains except four temples, and these neither so entire nor magnificent as some others at a place called *Dendera*. Thebes has been

been celebrated by Homer for its hundred gates; but Mr Bruce informs us, that no vestiges of these are now remaining, neither can we discover the foundation of any wall it ever had; "and as for the horsemen and chariots it is said to have sent out, all the Thebaid sown with wheat would not have maintained one half of them. Thebes, at least the ruins of the temples called *Medinet Tabu*, are built in a long stretch of about a mile broad, most parsimoniously chosen at the sandy foot of the mountains. The *Horti Pensiles*, or hanging gardens, were surely formed upon the sides of these hills, then supplied with water by mechanical devices. The utmost is done to spare the plain, and with great reason; for all the space of ground this ancient city has had to maintain its myriads of horses and men, is a plain of three quarters of a mile broad between the town and the river, upon which plain the water rises to the height of four and five feet. All this pretended populousness of ancient Thebes I therefore believe to be fabulous."

Bruce's Travels.

Mr Bruce, after examining the ground on which Thebes is supposed to have stood, thinks that it had no walls, and that consequently Homer's story of its having an hundred gates is misunderstood. The mountains of the Thebaid stand close behind the town, not in a ridge, but standing single, so that you can go round each of them. A hundred of these are said to be hollowed out for sepulchres and other purposes. These, he thinks, were the hundred gates of Homer; in proof of this they are still called by the natives *Beeban el Meluke*, "the ports or gates of the kings."

All that is said of Thebes by poets or historians after the days of Homer is meant of Diospolis, which was built by the Greeks long after Thebes was destroyed, as its name testifies; though Diodorus says it was built by Busiris. It was on the east side of the Nile, whereas ancient Thebes was on the west, though both are considered as one city; and Strabo says, that the river runs through the middle of Thebes, by which he means between Old Thebes and Diospolis.

THEFT, or SIMPLE LARCENY, is "the felonious taking and carrying away of the personal goods of another." This offence certainly commenced then, whenever it was, that the bounds of property, or laws of *meum* and *tuum*, were established. How far such an offence can exist in a state of nature, where all things are held to be common, is a question that may be solved with very little difficulty. The disturbance of any individual in the occupation of what he has seized to his present use, seems to be the only offence of this kind incident to such a state. But, unquestionably, in social communities, when property is established, any violation of that property is subject to be punished by the laws of society; though how far that punishment should extend is matter of considerable doubt.

By the Jewish law it was only punished with a pecuniary fine, and satisfaction to the party injured; and in the civil law, till some very late constitutions, we never find the punishment capital. The laws of Draco at Athens punished it with death: but his laws were said to be written with blood; and Solon afterwards changed the penalty to a pecuniary mulct. And so the Attic law in general continued; except that once, in a time of dearth, it was made capital to break into a garden and steal figs: but this law, and the informers against the offence, grew so odious, that from them all malicious informers were styled *sycophants;* a name which we have much perverted from its original meaning. From these examples, as well as the reason of the thing, many learned and scrupulous men have questioned the propriety, if not lawfulness, of inflicting capital punishment for simple theft. And certainly the natural punishment for injuries to property seems to be the loss of the offender's own property; which ought to be universally the case, were all men's fortunes equal. But as those who have no property themselves are generally the most ready to attack the property of others, it has been found necessary, instead of a pecuniary, to substitute a corporal punishment; yet how far this corporal punishment ought to extend, is what has occasioned the doubt. Sir Thomas More and the Marquis Beccaria, at the distance of more than two centuries, have very sensibly proposed that kind of corporal punishment which approaches the nearest to a pecuniary satisfaction, viz. a temporary imprisonment, with an obligation to labour, first for the party robbed, and afterwards for the public, in works of the most slavish kind; in order to oblige the offender to repair, by his industry and diligence, the depredations he had committed upon private property and public order. But, notwithstanding all the remonstrances of speculative politicians and moralists, the punishment of theft still continues throughout the greatest part of Europe to be capital: and Puffendorf, together with Sir Matthew Hale, are of opinion that this must always be referred to the prudence of the legislature; who are to judge, say they, when crimes are become so enormous as to require such sanguinary restrictions. Yet both these writers agree, that such punishment should be cautiously inflicted, and never without the utmost necessity.

The Anglo-Saxon laws nominally punished theft with death, if above the value of twelvepence: but the criminal was permitted to redeem his life by a pecuniary ransom; as, among their ancestors the Germans, by a stated number of cattle. But in the 9th year of Henry I. this power of redemption was taken away, and all persons guilty of larceny above the value of twelvepence were directed to be hanged; which law continues in force to this day. For though the inferior species of theft, or petit larceny, is only punished by whipping at common law, or (by stat. 4 Geo. I. c. 11.) may be extended to transportation for seven years, as is also expressly directed in the case of the Plate-glass Company; yet the punishment of grand larceny, or the stealing above the value of twelvepence (which sum was the standard in the time of King Athelstan, 800 years ago), is at common law regularly death: which, considering the great intermediate alteration in the price or denomination of money, is undoubtedly a very rigorous constitution; and made Sir Henry Spelman (above a century since, when money was at twice its present rate) complain, that while every thing else was risen in its nominal value, and become dearer, the life of man had continually grown cheaper. It is true, that the mercy of juries will often make them strain a point, and bring in larceny to be under the value of twelvepence, when it is really of much greater value: but this, though evidently justifiable and proper when it only reduces the present nominal value of money to the ancient standard, is otherwise a kind of pious perjury, and does not at all excuse our common law in this respect from the imputation of severity,

verity, but rather ſtrongly confeſſes the charge. It is likewiſe true, that by the merciful extenſions of the benefit of clergy by our modern ſtatute-law, a perſon who commits a ſimple larceny to the value of thirteen pence or thirteen hundred pounds, though guilty of a capital offence, ſhall be excuſed the pains of death; but this is only for the firſt offence. And in many caſes of ſimple larceny the benefit of clergy is taken away by ſtatute: as from horſe-ſtealing in the principals and acceſſories both *before* and *after* the fact; theft by great and notorious thieves in Northumberland and Cumberland; taking woollen cloth from off the tenters, or linens, fuſtians, calicoes, or cotton goods, from the place of manufacture (which extends, in the laſt caſe, to aiders, aſſiſters, procurers, buyers, and receivers); feloniouſly driving away, or otherwiſe ſtealing one or more ſheep or other cattle ſpecified in the acts, or killing them with intent to ſteal the whole or any part of the carcaſe, or aiding or aſſiſting therein; thefts on navigable rivers above the value of forty ſhillings, or being preſent, aiding and aſſiſting thereat; plundering veſſels in diſtreſs, or that have ſuffered ſhipwreck; ſtealing letters ſent by the poſt; and alſo ſtealing deer, hares, and conies, under the peculiar circumſtances mentioned in the Waltham black act. Which additional ſeverity is owing to the great malice and miſchief of the theft in ſome of theſe inſtances; and others, to the difficulties men would otherwiſe lie under to preſerve thoſe goods, which are ſo eaſily carried off. Upon which laſt principle the Roman law puniſhed more ſeverely than other thieves the *Abigei* or ſtealers of cattle, and the *Balnearii* or ſuch as ſtole the clothes of perſons who were waſhing in the public baths; both which conſtitutions ſeem to be borrowed from the laws of Athens. And ſo, too, the ancient Goths puniſhed with unrelenting ſeverity thefts of cattle, or of corn that was reaped and left in the field: ſuch kind of property (which no human induſtry can ſufficiently guard) being eſteemed under the peculiar cuſtody of heaven.

Theft-Bote (from the Saxon *theof*, i. e. *fur*, and *bate*, *compenſatio*), is the receiving of a man's goods again from a thief, after ſtolen, or other amends not to proſecute the felon, and to the intent the thief may eſcape; which is an offence puniſhable with fine and impriſonment, &c.

THELIGONUM, a genus of plants belonging to the claſs monœcia, and order of polyandria; and in the natural ſyſtem ranging under the 53d order, *Scabridæ*, See Botany *Index*.

THEME, denotes the ſubject of an exerciſe for young ſtudents to write or compoſe on.

THEMISON, a phyſician of Laodicea, a diſciple of Aſclepiades. He founded the methodic ſect, with a view to the more eaſily teaching and practiſing the art of medicine. (See Medicine, n° 37.). Themiſon gave the firſt account of diacodium, which was prepared of the juice and decoction of poppy-heads and honey.

THEMISTIUS, an ancient Greek orator and philoſopher, a native of Paphlagonia, who flouriſhed in the 4th century. He had great intereſt and favour with the emperors in his time, and though a heathen, was of a very tolerating ſpirit. He taught for many years at Conſtantinople, of which city he was made præfect by Julian and Theodoſius; and lived to a great age. More than 30 of his orations are ſtill extant, beſide commentaries on ſeveral parts of Ariſtotle's works.

THEMISTOCLES, the renowned Athenian admiral, general, and patriot, who gained the battle of Salamis againſt the Perſians. Being baniſhed his country by his ungrateful fellow-citizens, he fled to Artaxerxes king of Perſia: but, in order to avoid taking up arms againſt his country, he ſlew himſelf, 464 B. C. See Attica, n° 76, *et ſeq.*

THEOBALD, Lewis, the ſon of an attorney at Sittingbourn in Kent, was a well-known writer and critic in the early part of the 18th century. He engaged in a paper called the *Cenſor*, publiſhed in Miſt's Journal, wherein, by delivering his opinions with too little reſerve concerning ſome eminent wits, he expoſed himſelf to their reſentment. Upon the publication of Pope's Homer, he praiſed it in terms of extravagant admiration, yet afterwards thought proper to abuſe it as earneſtly; for which Pope at firſt made him the hero of his Dunciad, though he afterwards laid him aſide for another. Mr Theobald not only expoſed himſelf to the laſhes of Pope, but waged war with Mr Dennis, who treated him more roughly, though with leſs ſatire. He nevertheleſs publiſhed an edition of Shakeſpeare, in which he corrected, with great pains and ingenuity, many faults that had crept into that poet's writings. This edition is ſtill in great eſteem; being in general preferred to thoſe publiſhed by Pope, Warburton, and Hanmer. He alſo wrote ſome plays, and tranſlated others from the ancients.

THEOBROMA, a genus of plants belonging to the claſs of polyadelphia, and order of pentandria; and in the natural ſyſtem ranging under the 37th order *Columniferæ*. See Botany *Index*.

THEOCRACY, in matters of government, a ſtate governed by the immediate direction of God alone: ſuch was the ancient government of the Jews before the time of Saul.

THEOCRITUS, the father of paſtoral poetry, was born at Syracuſe in Sicily. Two of his poems aſcertain his age; one addreſſed to Hiero king of Syracuſe, who began his reign about 275 years before Chriſt; and the other to Ptolemy Philadelphus king of Egypt. Hiero, though a prince diſtinguiſhed in arms and political wiſdom, does not ſeem to have been a patron of learning. This is ſuppoſed to have given birth to the 16th Idyllium. From Syracuſe Theocritus went to Alexandria, where he ſeems to have found a munificent patron in Ptolemy Philadelphus, if we may judge from the panegyric which he compoſed on that prince (the 17th Idyllium). It has been ſaid that Theocritus was ſtrangled by Hiero, but we have not found evidence of this.

The compoſitions of this poet are diſtinguiſhed, among the ancients, by the name of *Idylliums*, in order to expreſs the ſmallneſs and variety of their natures: they would now be called *Miſcellanies*, or *Poems on ſeveral Occaſions*. The firſt nine and the eleventh are confeſſed to be true paſtorals, and hence Theocritus has uſually paſſed for nothing more than a paſtoral poet; yet he is manifeſtly robbed of a great part of his fame, if his other poems have not their proper laurels. For though the greater part of his Idylliums cannot be called the ſongs of ſhepherds, yet they have certainly their reſpective merits. His paſtorals ought to be conſidered as the foundation of his credit; upon this claim he will be admitted for the finiſher as well as the inventor of his art, and will be acknowledged to have excelled all his imitators as much as originals uſually do their copies.

The works of this poet were first published in folio by Aldus Manutius at Venice in 1495. A more elegant and correct edition was printed by Henry Stephens at Paris in 1566. An edition was published at Leipsic in 1765, with valuable notes by the learned Reiske. But what will most highly gratify the admirers of pastoral poetry, is an edition published in 1770, 2 vols 4to, by Mr Thomas Wharton. It is accompanied by the scholia of the best editors, and the different readings of 15 MSS.

THEODOLITE, a mathematical instrument for measuring heights and distances. See MENSURATION and SURVEYING.

THEODORE, king of Corsica, Baron Nieuhoff in the county of La Marc in Westphalia. He had his education in the French service, and afterwards went to Spain, where he received some marks of regard from the duke of Riperda and Cardinal Alberoni; but being of an unsettled disposition, he quitted Spain, and travelled into Italy, England, and Holland, in search of some new adventure. He at last fixed his attention on Corsica, and formed the scheme of rendering himself sovereign of that island. He was a man of abilities and address; and having fully informed himself of every thing relating to Corsica, went to Tunis, where he fell upon means to procure some money and arms; and then went to Leghorn, from whence he wrote a letter to the Corsican chiefs Giafferi and Paoli, offering considerable assistance to the nation if they would elect him as their sovereign. This letter was consigned to Count Domenico Rivarola, who acted as Corsican plenipotentiary in Tuscany, and he gave for answer, that if Theodore brought the assistance he promised to the Corsicans, they would very willingly make him king.

Upon this he, without loss of time, set sail, and landed at Tavagna in the spring of the year 1736. He was a man of a very stately appearance, and the Turkish dress he wore added to the dignity of his mein. He had a few attendants with him; and his manners were so engaging, and his offers so plausible, that he was proclaimed king of Corsica before Count Rivarola's dispatches arrived to inform the chiefs of the terms upon which he had agreed. He brought with him about 1000 zequins of Tunis, besides some arms and ammunition, and made magnificent promises of foreign assistance; whence the Corsicans, who were glad of any support, willingly gave into his schemes. Theodore instantly assumed every mark of royal dignity. He had his guards and his officers of state; he conferred titles of honour, and struck money both of silver and copper. The silver pieces were few in number, and can now hardly be met with; the copper coins have on one side T. R. that is, "Theodorus Rex," with a double branch crossed, and round it this inscription, PRO BONO PUBLICO RE. CO. that is, "For the public good of the kingdom of Corsica:" on the other side is the value of the piece; *Cinque solidi*, or five sous.

The Genoese were not a little confounded with this unexpected adventurer. They published a violent manifesto against Theodore, treating him with great contempt; but at the same time showing they were alarmed at his appearance. Theodore replied, in a manifesto, with all the calmness and dignity of a monarch; but after being about eight months in Corsica, perceiving that the people began to cool in their affections towards him, he assembled his chiefs, and declared he would keep them no longer in a state of uncertainty, being determined to seek in person the support he so long expected. He settled an administration during his absence, recommended unity in the strongest terms, and left the island with reciprocal assurances of fidelity and affection. He went to Holland, where he was so successful as to obtain credit from several rich merchants, particularly Jews, who trusted him with cannon and other warlike stores to a great value, under the charge of a supercargo. With these he returned to Corsica in 1739; but by this time the French, as auxiliaries to the Genoese, had become so powerful in the island, that though Theodore threw in his supply of warlike stores, he did not incline to venture his person, the Genoese having set a high price on his head. He therefore again departed; and after many unavailing attempts to recover his crown, at length chose for retirement a country where he might enjoy the participation of that liberty which he had so vainly endeavoured to give his Corsicans; but his situation in England by degrees grew wretched, and he was reduced so low as to be several years before his death a prisoner for debt in the King's Bench. At length, to the honour of some gentlemen of rank, a charitable contribution was set on foot for him in the year 1753. Mr Boswell observes, that Mr Horace Walpole generously exerted himself for the unhappy Theodore, and wrote a paper in *The World* with great elegance and humour, soliciting a contribution for the unhappy monarch in distress, to be paid to Mr Robert Dodsley bookseller, as lord high treasurer. This brought him a very handsome sum, and he was set at liberty. That gentleman adds, that Mr Walpole has the original deed, by which Theodore made over the kingdom of Corsica in security to his creditors, and that he has also the great seal of the kingdom. Theodore died in 1756, and was buried in St Anne's churchyard, Westminster; where, in 1757, a simple unadorned monument of marble was erected to his memory by a gentleman, with an inscription, which, after mentioning some of the above particulars, concludes with the following lines:

The grave, great teacher, to a level brings
Heroes and beggars, galley-slaves and kings:
But Theodore this moral learn'd ere dead,
Fate pour'd its lesson on his living head,
Bestow'd a kingdom and deny'd him bread.

THEODORET, bishop of St Cyricus in Syria, in the 4th century, and one of the most learned fathers of the church, was born in the year 386, and was the disciple of Theodorus Mopsuestia and St John Chrysostom. Having received holy orders, he was with difficulty persuaded to accept of the bishopric of St Cyricus, about the year 420. He discovered great frugality in the expences of his table, dress, and furniture, but spent considerable sums in improving and adorning the city of Cyricus. He erected two large bridges, public baths, fountains, and aqueducts, and laboured with great zeal and success in his diocese. Yet his zeal was not confined to his own church: he went to preach at Antioch and the neighbouring towns; where he became admired for his eloquence and learning, and had the happiness to convert multitudes of people. He wrote in favour of John of Antioch and the Nestorians, against Cyril's Twelve Anathemas: he afterwards attacked the opinions of Nestorius, and was deposed in the synod held by the Eutychians,

Theodoret, Theodosius.

Eutychians at Ephesus; but was again restored by the general council of Chalcedon, in which he was present, in 451. It is thought that he died soon after; though others say that he lived till the year 457. There are still extant Theodoret's excellent Commentary on St Paul's Epistles, and on several other books of the Holy Scriptures. 2. His Ecclesiastical History from the time of Arius to Theodosius the Younger. 3. The History of the famous Anchorites of his time. 4. Epistles. 5. Discourses on Providence. And, 6. An excellent treatise against the Pagans, entitled, *De Curandis Græcorum Affectibus*; and other works. The best edition of all which is that of Father Sirmond in Greek and Latin, in 4 vols folio.

THEODOSIUS I. called the *Great*, was a native of Spain. The valour he had shown, and the great services he had done to the empire, made Gratian, when attacked by the Goths and Germans, to admit him as a partner in the government. He received the purple in 379, aged 43. See CONSTANTINOPLE, n° 77—88.

Theogony, Theognis.

THEOGONY, from Θεος, *God*, and γονη, "seed, offspring," that branch of the heathen theology which taught the genealogy of their gods.

Hesiod gives us the ancient theogony in a poem under that title. Among the most ancient writers, Dr Burne observes that theogony and cosmogony signified the same thing. In effect, the generation of the gods of the ancient Persians, fire, water, and earth, is apparently no other than that of the primary elements.

THEOGNIS, an ancient Greek poet of Megara in Achaia, flourished about the 59th Olympiad, 144 B. C. We have a moral work of his extant, containing a summary of precepts and reflections, usually found in the collections of the Greek minor poets.

THEOLOGY

1 Definition.

IS a Greek word (θεολογια), and signifies that science which treats of the being and attributes of God, his relations to us, the dispensations of his providence, his will with respect to our actions, and his purposes with respect to our end. The word was first used to denote the fables of those poets and philosophers who wrote of the genealogy and exploits of the gods of Greece. It was afterwards adopted by the earliest writers of the Christian church, who styled the author of the Apocalypse, by way of eminence, ὁ θεολογος, *the Divine*.

Although every pagan nation of antiquity had some tutelary deities peculiar to itself, they may yet be considered as having all had the same theology, since an intercommunity of gods was universally admitted, and the heavenly bodies were adored as the *dii majorum gentium* over the whole earth. This being the case, we are happily relieved from treating, in the same article, of the truths of Christianity and the fictions of paganism, as we have elsewhere traced idolatry from its source, and shewn by what means "the foolish hearts of men became so darkened that they changed the glory of the incorruptible God into an image made like to corruptible man, and to birds, and four-footed beasts, and creeping things." See POLYTHEISM.

The absurdities and inconsistency of the pretended revelation of the Arabian impostor have been sufficiently exposed under the words ALCORAN and MAHOMETANISM; so that the only theology of which we have to treat at present is the *Christian* theology, which comprehends that which is commonly called *natural*, and that which is *revealed* in the scriptures of the Old and New Testaments. These taken together compose a body of science so important, that in comparison with it all other sciences sink into insignificance; for without a competent knowledge of the attributes of God, of the several relations in which he stands to us, and of the ends for which we were created, it is obvious that we must wander through life like men groping in the dark, strangers to the road on which we are travelling, as well as to the fate awaiting us at the end of our journey.

2 Christian theology,

But if this knowledge be necessary to all Christians, it is doubly so to those who are appointed to feed the flock of Christ, and to teach the ignorant what they are to believe, and what to do, in order to work out their own salvation. The wisdom and piety of our ancestors have accordingly founded professorships of theology in all our universities, where the principles of our religion are taught in a systematic and scientific manner; and the church has ordained, that no man shall be admitted to the office of a preacher of the gospel who has not attended a regular course of such theological lectures.

3 to be studied carefully by those intended for the service of the church.

It must not, however, be supposed, that, by merely listening to a course of lectures however able, any man will become an accomplished divine. The principles of this science are to be found only in the word and works of God; and he who would extract them pure and unsophisticated, must dig for them himself in that exhaustless mine. To fit a man for this important investigation, much previous knowledge is requisite. He must study the works of God scientifically before he can perceive the full force of that testimony which they bear to the power, the wisdom, and the goodness of their author. Hence the necessity of a general acquaintance with the physical and mathematical sciences before a man enter on the proper study of theology, for he will not otherwise obtain just and enlarged conceptions of the God of the universe. See PHYSICS, N° 115.

4 Previous knowledge requisite for the prosecution of this study.

But an acquaintance with the physical and mathematical sciences is not alone a sufficient preparation for the study of theology. Indeed it is possible for a man to devote himself so wholly to any of these sciences, as to make it counteract the only purposes for which it can be valuable to the divine; for he who is constantly immersed in matter, is apt to suspect that there is no other substance; and he who is habituated to the routine of geometrical demonstration, becomes in time incapable of reasoning at large, and estimating the force of the various degrees of moral evidence. To avert these disagreeable consequences, every man, before he enter on the study of that science which is the subject of the present article, should make himself acquainted with the principles of logic, the several powers of the human mind, and the different sources of evidence; in doing which he will find the greatest assistance from Bacon's *Novum Organum*,

Introduction.

ganum, Locke's *Essay on the Human Understanding*, Reid's *Essays on the Intellectual and Active Powers of Man*, and Tatham's *Chart and Scale of Truth*. These works will teach him to think justly, and guard him against a thousand errors, which those who have not laid such a foundation are apt to embrace as the truths of God.

The man who proposes to study theology ought to have it in view, as the ultimate end of his labours, to impart to others that knowledge which he may procure for himself. "Amongst the many marks which distinguish the *Christian* philosopher from the *Pagan*, this (says a learned writer *) is one of the most striking—the *Pagan* sought knowledge in a selfish way, to secrete it for his own use; the *Christian* seeks it with the generous purpose (first in view, though last in execution) to impart it to others. The Pagan philosopher, therefore, having cultivated the *art of thinking*, proceeds to that of *speaking*, in order to display his vanity in the dexterous use of deceit. On the other hand, the *Christian philosopher* cultivates the *art of speaking*, for the sole purpose of disseminating the truth in his office of preacher of the gospel."

* *Warburton.*

As every man, before he enters on the proper study of theology, receives, at least in this country, the rudiments of a liberal education, it may perhaps be superfluous to mention here any books as peculiarly proper to teach him the art of speaking: we cannot however forbear to recommend to our student the attentive perusal of Quintilian's *Institutions*, and Dr Blair's *Lectures on Rhetoric and the Belles Lettres*. A familiar acquaintance with these works will enable him, if he be endowed by nature with talents fit for the office in which he proposes to engage, to express his thoughts with correctness and elegance; "without which, it has been well observed, that science, especially in a clergyman, is but learned lumber, a burden to the owner, and a nuisance to every body else."

No man can proceed thus far in the pursuits of general science without having been at least initiated in the learned languages; but he who intends to make theology his profession should devote himself more particularly to the study of Greek and Hebrew, because in these tongues the original scriptures are written. He who is incapable of consulting the original scriptures, must rest his faith, not on the sure foundation of the word of God, but on the credit of fallible translators; and if he be at any time called on to vindicate revelation against the scoffs of infidelity, he will have to struggle with many difficulties which are easily solved by him who is master of the original tongues.

5 Cautions to be observed in attending the lectures of a professor.

The student having laid in this stock of preparatory knowledge, is now qualified to attend with advantage the theological lectures of a learned professor; but in doing this, he should be very careful neither to admit nor reject any thing on the bare authority of his master. Right principles in theology are of the utmost importance, and can rest on no authority inferior to that of the word of God. On this account we have long been of opinion, that a professor cannot render his pupils so much service by a systematical course of lectures, as by directing their studies, and pointing out the road in which they may themselves arrive in the shortest time at the genuine sense of the sacred scriptures. In this opinion we have the honour to agree with the ablest lecturer * in theology that we have ever heard. The authors of all systems are more or less prejudiced in behalf of some particular and artificial mode of faith. He, therefore, who begins with the study of them, and afterwards proceeds to the sacred volume, sees with a jaundiced eye every text supporting the peculiar tenets of his first master, and acts as absurd a part as he who tries not the gold by the copel, but the copel by the gold. Before our young divine, therefore, sit down to the serious perusal of any one of those *institutes* or *bodies of theology* which abound in all languages, and even before he read that which the nature of our work compels us to lay before him, we beg leave to recommend to his consideration the following

* *The late Dr Campbell of Aberdeen.*

Introduction.

Preliminary Directions for the Study of Theology.

6 Christian theology divided into two great parts.

Christian theology is divided into two great parts, *natural* and *revealed*; the former comprehending that which may be known of God from the creation of the world, even his eternal power and Godhead; the latter, that which is discovered to man nowhere but in the sacred volume of the Old and New Testaments.

7 First principles of theology communicated

Concerning the extent of natural theology many opinions have been formed, whilst some have contended that there is no such thing. Into these disputes we mean not at present to enter. We believe that one of them could have had no existence among sober and enlightened men, had the contending parties been at due pains to define with accuracy the terms which they used. Whatever be the origin of religion, which we have endeavoured to ascertain elsewhere (see Religion, N° 6—17.), it is obvious, that no man can receive a written book as the word of God till he be convinced by some other means that God exists, and that he is a Being of power, wisdom, and goodness, who watches over the conduct of his creature man. If the progenitor of the human race was instructed in the principles of religion by the Author of his being (a fact of which it is difficult to conceive how a consistent theist can entertain a doubt), he might communicate to his children, by natural means, much of that knowledge which he himself could not have discovered had he not been supernaturally enlightened. Between illustrating or proving a truth which is already talked of, and making a discovery of what is wholly unknown, every one perceives that there is an immense difference (A).

To beings whose natural knowledge originates wholly from

(A) The discriminating powers of Aristotle will not be questioned; and in the following extract made by Cicero from some of his works which are now lost, he expresses our sentiments on this important subject with his usual precision:——"Præclare ergo Aristoteles, SI ESSENT, inquit, qui sub terra semper habitavissent, bonis, et illustribus domiciliis, quæ essent ornata signis atque picturis, instructaque rebus iis omnibus, quibus abundant ii, qui beati putantur, nec tamen exissent unquam supra terram: ACCEPISSENT AUTEM FAMA ET AUDITIONE, ESSE QUODDAM NUMEN,

Preliminary Directions.

8 to the earliest mortals by repeated revelations;

from ſenſation, and whoſe minds cannot, but by much diſcipline, advance from ſenſe to ſcience, a long ſeries of revelations might be neceſſary to give them at firſt juſt notions of God and his attributes, and to enable them to perceive the relation between the effect and its cauſe, ſo as to infer by the powers of their own reaſon the exiſtence of the Creator from the preſence of his creatures. Such revelations, however, could be ſatisfactory only to thoſe who immediately received them. Whenever the Deity has been pleaſed by ſupernatural means to communicate any information to man, we may be ſure that he has taken effectual care to ſatisfy the perſon ſo highly favoured that his underſtanding was not under the influence of any illuſion; but ſuch a perſon could not communicate to another the knowledge which he had thus received by any other means than an addreſs to his rational faculties. No man can be required to believe, no man indeed can believe, without proof, that another, who has no more faculties either of ſenſation or intellect than himſelf, has obtained information from a ſource to which he has no poſſible acceſs. An appeal to miracles would in this caſe ſerve no purpoſe; for we muſt believe in the exiſtence, power, wiſdom, and juſtice of God, before a miracle can be admitted as evidence of any thing but the power of him by whom it is performed. See MIRACLE.

9 and yet may be properly termed natural principles.

It is therefore undeniable that there are ſome principles of theology which may be called *natural;* for though it is in the higheſt degree probable that the parents of mankind received all their theological knowledge by *ſupernatural* means, it is yet obvious that ſome parts of that knowledge muſt have been capable of a proof purely rational, otherwiſe not a ſingle religious truth could have been conveyed through the ſucceeding generations of the human race but by the immediate inſpiration of each individual. We indeed admit many propoſitions as certainly true, upon the ſole authority of the Jewiſh and Chriſtian ſcriptures, and we receive theſe ſcriptures with gratitude as the lively oracles of God; but it is ſelf-evident that we could not do either the one or the other, were we not convinced by natural means that God exiſts, that he is a Being of goodneſs, juſtice, and power, and that he inſpired with divine wiſdom the penmen of theſe ſacred volumes. Now, though it is very poſſible that no man or body of men, left to themſelves from infancy in a deſert world, would ever have made a theological diſcovery; yet whatever propoſitions relating to the being and attributes of the firſt cauſe and the duty of man, can be demonſtrated by human reaſon, independent of written revelation, may be called *natural theology*, and are of the utmoſt importance, as being to us the firſt principles of all religion. Natural theology, in this ſenſe of the word, is the foundation of the Chriſtian revelation; for without a previous knowledge of it, we could have no evidence that the ſcriptures of the Old and New Teſtaments are indeed the word of God.

10 Natural theology to be ſtudied before the doctrines of revelation.

Our young divine, therefore, in the regular order of his ſtudies, ought to make himſelf maſter of *natural theology* before he enter upon the important taſk of ſearching the ſcriptures. On this ſubject many books have been publiſhed in our own and other languages; but perhaps there is none more worthy of attention than the Religion of Nature delineated by Mr Wollaſton (B). It is a work of great merit, and bears ample teſtimony to its author's learning and acuteneſs: yet we think it ought to be read with caution. Mr Wollaſton's theory of moral obligation is fanciful and groundleſs; and whilſt we readily acknowledge that he demonſtrates many truths with elegance and perſpicuity, we cannot deny that he attempts a proof of others, for which we believe no other evidence can be brought than the declarations of Chriſt and his apoſtles in the holy ſcriptures. To ſupply the defects of his theory of morals, we would recommend to the ſtudent an attentive peruſal of Cumberland on the Law of Nature, and Paley's Elements of Moral Philoſophy. A learned author * affirms of Cumberland, that "he excels all men in fixing the

11. Books recommended.

* *Warburton.*

NUMEN, ET VIM DEORUM; deinde aliquo tempore, patefactis terræ faucibus, ex illis abditis ſedibus evadere in hæc loca, quæ nos incolimus, atque exire potuiſſent: cum repente terram, et maria, cœlumque vidiſſent: nubium magnitudinem, ventorumque vim cognoviſſent, adſpexiſſentque ſolem, ejuſque tum magnitudinem, pulchritudinemque, tum etiam efficientiam cognoviſſent, quod is diem efficeret, toto cœlo luce diffuſa: cum autem terras nox opacaſſet, tum cœlum totum cernerent aſtris diſtinctum et ornatum, lunæque luminum varietatem tum creſcentis, tum ſeneſcentis, eorumque omnium ortus et occaſus, atque in omni æternitate ratos, immutabileſque curſus: hæc cum viderent, PROFECTO ET ESSE DEOS, et HÆC TANTA OPERA DEORUM ESSE arbitrarentur." *De Nat. Deorum*, lib. ii. § 37.

From this paſſage it is evident, that the Stagyrite, though he conſidered the motions of the heavenly bodies, the ebbing and flowing of the ſea, and the other phenomena of nature, as affording a complete *proof* of the being and providence of God, did not however ſuppoſe that from theſe phenomena an untaught barbarian would *diſcover* this fundamental principle of religion. On the contrary, he expreſsly affirms, that before a man can feel the force of the evidence which they give of this important truth, he muſt have HEARD of the exiſtence and power of God.

(B) It may not be improper to inform the reader, that Mr Wollaſton, the author of the Religion of Nature, was a different man from Mr Woolſton, who blaſphemed the miracles of our Saviour. The former was a clergyman of great piety, and of ſuch moderate ambition as to refuſe one of the higheſt preferments in the church of England when it was offered to him; the latter was a clergyman likewiſe, but remarkable only for gloomy infidelity, and a perverſe deſire to deprive the wretched of every ſource of comfort. In the mind of the former, philoſophy and devotion were happily united; in the mind of the latter, there was neither devotion nor ſcience. Yet theſe writers have been frequently confounded; ſometimes through inadvertence from the ſimilarity of their names; and ſometimes, we are afraid, deſignedly, from a weak and bigotted abhorrence of every ſyſtem of religion that pretends to have its foundation in reaſon and in the nature of things.

Preliminary Directions.

the true grounds of moral obligation, out of which natural law and natural religion both arise;" and we have ourselves never read a work in which the various duties which a man owes to his Maker, himself, and his fellow-creatures, are more accurately stated or placed on a surer basis than in the moral treatise of the archdeacon of Carlisle.

As Wollaston demonstrates with great perspicuity, the being and many of the attributes of God, it may perhaps appear superfluous to recommend any other book on that subject. The present age, however, having among other wonderful phenomena, witnessed a revival of *Atheism*, we would advise our student to read with much attention Cudworth's Intellectual System, and to read it rather in Mosheim's Latin translation than in the author's original English. It is well known that Cudworth wrote his incomparable work in confutation of Hobbes's philosophy; but instead of confining himself to the whimsies of his antagonist, which were in a little time to sink into oblivion, he took a much wider range, and traced atheism through all the mazes of antiquity, exposing the weakness of every argument by which such an absurdity had ever been maintained. In exhausting the metaphysical questions agitated among the Greeks concerning the being and perfections of God, he has not only given us a complete history of ancient learning, as far as it relates to these inquiries, but has in fact anticipated most of the sophisms of our modern atheists, who are by no means such discoverers as they are supposed to be by their illiterate admirers.

The student having made himself master of natural theology, and carefully endeavoured to ascertain its limits, is now prepared to enter on the important task of searching the scriptures. In doing this, he ought to divest himself as much as possible of the prejudices of education in behalf of a particular system of faith, and sit down to the study of the sacred volume as of a work to which he is an entire stranger. He ought first to read it as a moral history of facts and doctrines, beginning with the books of Moses, and proceeding through the rest, not in the order in which they are commonly published, but in that in which there is reason to believe they were written (see SCRIPTURES). If he be master of the Hebrew and Greek languages, he will doubtless prefer the original text to any version; and in this perusal we would advise him to consult no commentator, because his object at present is not to study the doctrines contained in the bible, but merely to discover what are the subjects of which it treats. Many histories of the bible have been written; and were we acquainted with a good one, we should recommend it as a clue to direct the young divine's progress through the various books which compose the sacred volume. Stackhouse's history has been much applauded by some, and as much censured by others. It is not a work of which we can express any high degree of approbation; but if read with attention, it may no doubt be useful as a guide to the series of facts recorded in the scriptures. Between the Old and New Testaments there is a great chasm in the history of the Jewish nation; but it is supplied in a very able and satisfactory manner by Dr Prideaux, whose *Old and New Testament connected* is one of the most valuable historical works in our own or any other language. Shuckford's *Sacred and Profane History of the World connected* is likewise a work of merit, and may be read with advantage as throwing light on many passages of the Old Testament: but this author is not intitled to the same confidence with Prideaux, as his learning was not so great, and his partialities seem to have been greater.

12 How the scriptures are to be studied.

In thus making himself master of the history of the Old and New Testaments, the student will unavoidably acquire some general notion of the various doctrines which they contain. These it will now be his business to study more particularly, to ascertain the precise meaning of each, and to distinguish such as relate to the whole human race, from those in which Abraham and his posterity were alone interested. He must therefore travel over the sacred volume a second time; and still we would advise him to travel without a guide. From Walton's *Polyglot bible*, and the large collection called *Critici sacri*, he may indeed derive much assistance in his endeavours to ascertain the sense of a difficult text; but we think he will do well to make little use of commentators and expositors, and still less of system-builders, till he has formed some opinions of his own respecting the leading doctrines of the Jewish and Christian religions.

"Impressed (says an able writer) with an awful sense of the importance of the sacred volume, the philosophical divine will shake off the bias of prejudices however formed, of opinions however sanctioned, and of passions however constitutional, and bring to the study of it the advantage of a pure and impartial mind. Instead of wasting all his labour upon a number of minute and less significant particulars, and of refining away plain and obvious sense by the subtleties of a narrow and corrosive mind, his first object will be to institute a theological inquiry into the general design of the written word, and from principles fully contained and fairly understood, to illustrate the true *nature* and *genius of the religious dispensation* in all its parts. He will mark the difference between the first and second covenants, and observe the connection that subsists between them. He will trace the temporary economy of the *Old Testament*, and weigh the nature and intent of the *partial covenant* with the Jews; observing with astonishment how it was made introductory of better things to come: and he will follow it through the *law* and the *prophets* in its wonderful evolutions, till he see this vast and preparatory machine of providence crowned and completed in the eternal gospel. This *New Testament*, the last and best part of the religious dispensation, he will pursue through the sacred pages of that gospel with redoubled attention; contemplating the divine foundation on which it claims to be built, the supernatural *means* by which it was executed, and the immortal end which it has in view *." * *Tatham's Chart and Scale of Truth.*

In the course of this inquiry into the import of the sacred volume, the student will pay particular attention to the circumstances of the age and country in which its various writers respectively lived, and to the nature of the different *styles*, *analogical* and *parabolical*, in which it is written. He will likewise keep in mind that God, whom it claims for its author, is the parent of truth, and that all his actions and dispensations must be consistent with one another. He will therefore compare the different passages of the Old and New Testaments which relate to the same doctrine, or to the same event, reasonably concluding that the bible must be the best interpreter of itself; and though the opinions which he thus forms

Preliminary Directions.

forms may often be erroneous, they will ſeldom be dangerous errors, and may eaſily be corrected by mature reflection, or by conſulting approved authors who have treated before him of the various points which have been the ſubject of his ſtudies. Of this mode of proceeding one good conſequence will be, that, having from the ſacred ſcriptures formed a ſyſtem of theology for himſelf, he will afterwards ſtudy the ſyſtems of other men without any violent prejudices for or againſt them; he will be ſo much attached to his own opinions as not to relinquiſh them in obedience to mere human authority, at the ſame time that he will be ready to give them up when convinced that they are not well founded; and if he have read the ſcriptures attentively, he will have acquired ſuch a love of truth as to embrace her wherever ſhe may be found.

13 Approved ſyſtems of divinity.

As we have ſuppoſed that every man, after having formed a theological ſyſtem of his own, will conſult the ſyſtems of others, it may perhaps be expected that we ſhould here recommend thoſe which, in our opinion, are moſt worthy of his attention. To do this, however, would, we apprehend, be an interference with the rights of private judgement. But leſt we ſhould be ſuſpected of wiſhing to bias the mind of the young ſtudent toward the ſhort ſyſtem which we are obliged to give, we ſhall juſt obſerve, that by the divines of what is called the *Arminian ſchool*, Epiſcopius's *Theologiæ Inſtitutiones*, Limborch's *Theologia Chriſtiana*, and Locke's *Reaſonableneſs of Chriſtianity*, have long been held in the higheſt eſteem; whilſt the followers of Calvin have preferred the *Inſtitutiones* of their maſter, Turretine's *Inſtitutio Theologiæ Elenchticæ*, and Gill's *Body of Divinity*. This laſt work has many merits and many defects. Its ſtyle is coarſe and tedious; and the author embraces every opportunity of introducing the diſcriminating tenets of his ſect: but his book is fraught with profound learning, breathes the ſpirit of piety, and may be read with advantage by every divine who has previouſly formed the outlines of a ſyſtem for himſelf.

14 Books recommended on the Moſaic diſpenſation.

As the Jewiſh and Chriſtian diſpenſations are cloſely linked together, being only parts of one great whole, it is impoſſible to have an adequate notion of the latter without underſtanding the deſign of the former. Now, though the Moſaic religion is nowhere to be learned but in the Old Teſtament, it may be convenient for our ſtudent, after he has formed his own opinions of it from that ſacred ſource, to know what has been written on the ſubject by others. For illuſtrating the ritual law, a learned prelate warmly recommends the *Ductor Dubitantium* of Maimonides, and Spencer's book entitled *De Legibus Hebræorum Ritualibus*. Both works have undoubtedly great merit; but our young divine will do well to read along with them *Hermanni Witſii Ægyptiaca*, and Dr Woodward's Diſcourſe on the Worſhip of the Ancient Egyptians, where ſome of Spencer's notions are ſhortly and ably refuted. On the other parts of this diſpenſation, ſuch as the nature of its civil government; the rewards and puniſhments peculiar to it (c); its extraordinary adminiſtration by appointed agents, endowed with ſupernatural powers, and with the gifts of miracles and prophecy; the *double ſenſe* in which the latter is ſometimes involved; and the language conſequent on its nature and uſe—the reader will find much erudition and ingenuity diſplayed in the ſecond part of Warburton's *Divine Legation of Moſes demonſtrated*. That work is entitled to a ſerious peruſal; for it diſplays great learning and genius, and, we believe, the heavieſt cenſures have fallen on it from thoſe by whom it was never read.

15 Inquiry to be made into the reality of revelation.

Having proceeded thus far in the courſe, the ſtudent's next buſineſs ſhould be to inquire ſeriouſly what evidence there is that the doctrines which he has ſo carefully ſtudied were indeed revealed in times paſt by God. He muſt already have perceived, in the nature and tendency of the doctrines themſelves, ſtrong marks of their origin being more than human; but he muſt likewiſe have met with many difficulties, and he muſt prepare himſelf to repel the attacks of unbelievers. Here he will find opportunities of exerting the utmoſt powers of his reaſoning faculties, and of employing in the ſervice of religion all the ſtores he may have amaſſed of human learning. The ſcriptures pretend to have been written by ſeveral men who lived in different ages of the world; but the lateſt of them in an age very remote from the preſent. His firſt buſineſs therefore muſt be to prove the authenticity of theſe books, by tracing them up by hiſtorical evidence to the ſeveral writers whoſe names they bear. But it is not enough to prove them authentic. They profeſs to have been written by men divinely inſpired, and of courſe infallible in what they wrote. He muſt therefore inquire into the truth of this inſpiration. The Bible contains a number of truths doctrinal and moral, which are called *myſteries*, and aſſerted to be the immediate dictates of God himſelf. To evince this great point to man, a number of ſupernatural *teſts* and *evidences* are inſeparably connected with thoſe myſteries; ſo that if the former be true, the latter muſt be ſo likewiſe. He muſt therefore examine theſe teſts and evidences, to eſtabliſh the divinity of the Holy Scriptures;" and in this part of his courſe he will find much aſſiſtance from many writers whoſe defences of the truth and divinity of the Chriſtian religion do honour to human nature.

16 Books recommended on that ſubject.

The firſt ſtep towards the embracing of any truth is, to get fairly rid of the objections which are made to it; and the general objections made by deiſtical writers to the Chriſtian revelation are by no writer more completely removed than by Biſhop Butler, in his celebrated work entitled *The Analogy of Religion natural and revealed to the Conſtitution and Courſe of Nature*. This book therefore the ſtudent ſhould read with attention, and meditate on with patience; but as it does not furniſh a *poſitive proof* of the divinity of our religion, he ſhould paſs from it to *Grotius de Veritate Religionis Chriſtianæ*, and Stillingfleet's *Origines Sacræ*. Both theſe works are excellent; and the latter, which may be conſidered

(c) On this ſubject the reader will find many excellent obſervations in Biſhop Bull's *Harmonia Apoſtolica*, with its ſeveral defences, and in a ſmall book of Dr Wells's, entitled A Help for the Right Underſtanding of the ſeveral Divine Laws and Covenants, whereby man has been obliged through the ſeveral ages of the world to guide himſelf in order to ſalvation.

Preliminary Directions.

considered as an improvement of the former, is perhaps the fullest and ablest defence of revelation in general that is to be found in any language. In this part of the united kingdom it is now indeed scarcely mentioned, or mentioned with indifference; but half a century ago the English divines thought it a subject of triumph, and styled its author their *incomparable Stillingfleet*. Other works, however, may be read with great advantage, and none with greater than Paley's *Evidences of the Christian Religion*, and Leslie's *Short Method with the Deists*; which last work, in the compass of a very few pages, contains proofs of the divinity of the Jewish and Christian revelations, to which the celebrated Dr Middleton confessed (D), that for 20 years he had laboured in vain to fabricate a specious answer (E).

17 Jewish controversy to be studied,

Having satisfied himself of the truth of revelation in general, it may be worth the young divine's while to provide a defence of the Christian religion against the objections of modern Judaism. In this part of his studies he will need no other instruction than what he may reap from Limborch's work entitled *De Veritate Religionis Christianæ amica collatio cum erudito Judæo.* "In that disputation, which was held with Orobio, he will find all that the stretch of human parts on the one hand, or science on the other, can produce to varnish error or unravel sophistry. All the papers of Orobio in defence of Judaism, as opposed to Christianity, are printed at large, with Limborch's answers, section by section; and the subtilest sophisms of a very superior genius are ably and satisfactorily detected and exposed by the strong, profound, and clear reasoning, of this renowned remonstrant *." See OROBIO and LIMBORCH.

* *Warburton's Directions for the Study of Theology.*

18 and the various controversies among Christians themselves.

The various controversies subsisting between the several denominations of Christians, about points which separate them into different churches, ought next to be studied in the order of the course; for nothing is unimportant which divides the followers of that Master whose favourite precept was *love*. It has indeed been long fashionable to decry polemical divinity as an useless, if not a pernicious, study; but it is not impossible that this fashion has had its origin in ignorance, and that it tends to perpetuate those schisms which it professes to lament. We are, however, far from recommending to the young divine a perusal of the works of the several combatants on each side of a disputed question, till he has fitted himself for judging between them by a long course of preparatory study; and the only preparation which can fit him for this purpose is an impartial study of ecclesiastical history. He who has with accuracy traced the progress of our holy religion from the days of the apostles to the present time, and marked the introduction of new doctrines, and the rise of the various sects into which the Christian world is divided, is furnished with a criterion within himself by which to judge of the importance and truth of the many contested doctrines; whilst he who, without this preparation, shall read a multitude of books on any religious controversy, will be in danger of becoming a convert to his last author, if that author possess any tolerable share of art and ingenuity.

19 Importance of ecclesiastical history, and books recommended.

There are many histories of the Christian church which possess great merit, but we are acquainted with none which appears to us wholly impartial. Mosheim's is perhaps the most perfect compend (F); and one of its greatest excellencies is, that on every subject the best writers are referred to for fuller information. These indeed should often be consulted, not only to supply the defects necessarily resulting from the narrowness of the limits which the author, with great propriety, prescribed to himself; but also to correct his partial obliquities; for with all his merits, and they were many and great, he is certainly not free from the influence of prejudice. Indeed there is no coming at the true history of the primitive church, but by studying the works of the primitive writers; and the principal works of the first four centuries will amply reward the labour of perusing them (G). The rise and progress of the reformation in general, the most important period of church-history, may be best learned from Sleidan's book *De Statu Religionis et Reipublicæ, Carolo V. Cæsare, Commentarii;* the History of the Reformation of the Church of Scotland from Knox and Spotiswood; and that of the Church of England from the much applauded work of Bishop Burnet.

After this course of ecclesiastical history, the young divine may read with advantage the most important controversies which have agitated the Christian world. To enumerate these controversies, and to point out the ablest authors who have written on each, would be a tedious, and perhaps not a very profitable task. On one controversy, however, we are induced to recommend a very masterly work, which is Chillingworth's book against Knott, entitled *The Religion of Protestants a safe way to Salvation;* in which the school jargon of that Jesuit is admirably exposed, and the long dispute between

(D) This piece of information we had from the late Dr Berkeley, prebendary of Canterbury, who had it from Archbishop Secker, to whom the confession was made.

(E) To these defences of revelation we might have added the collection of sermons preached at Boyle's lecture from 1691 to 1732, published in three volumes folio, 1739; the works of Leland; Bishop Newton's Dissertations on Prophecy; and above all, Lardner's Credibility of the Gospel History, with the Supplement to it. But there would be no end of recommending eminent writers on this subject. We have mentioned such as we most approve among those with whom we are best acquainted; but we must, once for all, caution the reader against supposing that we approve of *every* thing to be found in any work except the sacred Scriptures.

(F) The bishop of Landaff, in the catalogue of books published at the end of his Theological Tracts, recommends several other ecclesiastical histories as works of great merit; such as, Dupin's, Echard's, Gregory's and Formey's, together with *Paul Ernesti Jablonski Institutiones Historiæ Christianæ*, published at Frankfort in three volumes, 1754-67.

(G) For a proof of this position, and for a just estimate of the value of the *Fathers*, as they are called, see the introduction to Warburton's Julian, and Kett's Sermons at Bampton's Lectures.

Preliminary Directions.

tween the Popiſh and Reformed churches placed on its proper ground, the Holy Scriptures.

20 Toleration.

One of the moſt plauſible objections to the ſtudy of polemical divinity, is its tendency to give a rigid turn to the ſentiments of thoſe long engaged in it; whilſt we know, from higher authority that "the end of the commandment is charity." But for preſerving charity in the minds of Chriſtians, there are better means than abſolute ignorance or indifference to truth. Charity is violated only when a church unreaſonably reſtrains the inquiries of its own members, or exerciſes intolerance towards thoſe who have renounced its juriſdiction. The injuſtice of the firſt ſpecies of eccleſiaſtical tyranny is expoſed in a very maſterly manner by Jeremy Taylor in his *Liberty of Prophecying*, and by Stillingfleet in his *Irenicum*; the injuſtice of the ſecond, by Locke in his celebrated Letters on Toleration. The man who ſhall peruſe theſe three works, and impartially weigh the force of their arguments, will be in little danger of thinking uncharitably of thoſe from whoſe principles the love of truth may compel him to diſſent.

In theſe directions for the ſtudy of theology, we might have enumerated many more books on each branch of the ſubject well deſerving of the moſt attentive peruſal; but he who ſhall have gone through the courſe here recommended, will have laid a foundation on which he may raiſe ſuch a ſuperſtructure as will entitle him to the character of an accompliſhed divine. His diligence muſt indeed be continued through life; for when a man ceaſes to make acquiſitions in any department of learning, he ſoon begins to loſe thoſe which he has already made; and a more contemptible character is nowhere to be found than that of a clergyman unacquainted with the learning of his profeſſion. This learning, however, is not to be acquired, and indeed is ſcarcely to be preſerved, by ſtudying *bodies* or *inſtitutes of theology*; and though we have mentioned a few generally approved by two rival ſects of Chriſtians, and muſt, in conformity with the plan of our work, give another ourſelves, we do not heſitate to declare, that the man who has carefully gone through the courſe of ſtudy which we have recommended, though it be little more than the outlines on which he is to work, may, with no great loſs to himſelf, neglect ours and all other ſyſtems. For as an excellent writer *, whom we have often quoted, well obſerves, "to judge of the *fact* whether ſuch a revelation containing ſuch a principle, with its myſteries and credentials, was actually ſent from God and received by man, by examining the *evidences* and *circumſtances* which accompanied it—the *time* when, the *place* where, the *manner* how, it was delivered—the *form* in which it deſcends to us—and in what it is *contained*—together with the particular *ſubſtance* and *burden* of it—and how every part is to be rightly *underſtood*: theſe are the various and extenſive ſubjects which conſtitute the ſublime office of THEOLOGIC REASONING and the PROPER STUDY OF DIVINITY." On this account we ſhall paſs over ſlightly, many things which every clergyman ought thoroughly to underſtand, and confine ourſelves, in the ſhort compend which we are to give, to the chief articles of Chriſtian theology. In doing this, we ſhall endeavour to diveſt ourſelves of party prejudices; but as we are far from thinking that this endeavour will be completely ſucceſsful (for we believe there is no man totally free from prejudice), we cannot conclude this part of the article more properly than with the following ſolemn CHARGE, with which a very learned divine † always prefaced his Theological Lectures.

* *Tatham.*

† *Dr Taylor of Norwich.*

21 A charge to ſtudents of theology.

I. "I do ſolemnly charge you, in the name of the God of Truth, and of our Lord Jeſus Chriſt, who is the Way, the Truth, and the Life, and before whoſe judgement-ſeat you muſt in no long time appear, that in all your ſtudies and inquiries of a religious nature, preſent or future, you do conſtantly, carefully, impartially, and conſcientiouſly, attend to evidence, as it lies in the Holy Scriptures, or in the nature of things, and the dictates of reaſon; cautiouſly guarding againſt the ſallies of imagination, and the fallacy of ill-grounded conjecture.

II. "That you admit, embrace, or aſſent, to no principle or ſentiment by me taught or advanced, but only ſo far as it ſhall appear to you to be ſupported and juſtified by proper evidence from revelation or the reaſon of things.

III. "That if, at any time hereafter, any principle or ſentiment by me taught or advanced, or by you admitted or embraced, ſhall, upon impartial and faithful examination, appear to you to be dubious or falſe, you either ſuſpect or totally reject ſuch principle or ſentiment.

IV. "That you keep your mind always open to evidence: That you labour to baniſh from your breaſt all prejudice, prepoſſeſſion, and party-zeal: That you ſtudy to live in peace and love with all your fellow Chriſtians; and that you ſteadily aſſert for yourſelf, and freely allow to others, the unalienable rights of judgement and conſcience."

PART I. OF NATURAL THEOLOGY.

SECT. I. *Of the Being and Attributes of* GOD.

22 The being of God proved from

HE who cometh to God, ſays an ancient divine *, deeply read in the philoſophy of his age, muſt believe that he is, and that he is a rewarder of them who diligently ſeek him. This is a truth as undeniable as that a man cannot concern himſelf about a nonentity. The exiſtence of God is indeed the foundation of all religion, and the firſt principle of the ſcience which is the ſubject of this article. It is likewiſe a principle which muſt command the aſſent of every man who has any notion of the relation between effects and their cauſes, and whoſe curioſity has ever been excited by the phenomena of nature. This great and important truth we have elſewhere endeavoured to demonſtrate (ſee METAPHYSICS, Part III. Chap. vi.); but it may be proved by arguments leſs abſtracted than the nature of that article required us to uſe. Of theſe we ſhall give one or two, which we hope will be level to every ordinary capacity; while, at the ſame time, we earneſtly recommend to the young divine a diligent ſtudy of thoſe books on the

* *St Paul.*

the ſubject which we have mentioned in the preceding directions.

23 propagation of animals

We ſee that the human race, and every other ſpecies of animals, is at preſent propagated by the co-operation of two parents; but has this proceſs continued from eternity? A moment's reflection will convince us that it has not. Let us take any one man alive, and let us ſuppoſe his father and mother dead, and himſelf the only perſon at preſent exiſting: how came he into the world? It will be ſaid he was produced mechanically or chemically by the conjunction of his parents, and that his parents were produced in the ſame manner by theirs. Let this then be ſuppoſed; it muſt ſurely be granted, that when this man was born, an addition was made to the ſeries of the human race. But a ſeries which can be enlarged may likewiſe be diminiſhed; and by tracing it backwards, we muſt at ſome period, however remote, reach its beginning. There muſt therefore have been a firſt pair of the human race, who were not propagated by the conjunction of parents. How did theſe come into the world?

* See *Bentley's Boyle's Lectures.*

Anaximander tells us*, that the firſt men and all animals were bred in warm moiſture, incloſed in cruſtaceous ſkins like crab-fiſh or lobſters; and that when they arrived at a proper age, their ſhelly priſons growing dry, broke, and made way for their liberty. Empedocles informs us, that mother Earth at firſt brought forth vaſt numbers of legs, and arms, and heads, &c. which, approaching each other, arranging themſelves properly, and being cemented together, ſtarted up at once full grown men.

Surely thoſe ſages, or their followers, ſhould have been able to tell us why the earth has not in any climate this power of putting forth vegetable men or the parts of men at preſent. If this univerſal parent be eternal and ſelf-exiſtent, it muſt be incapable of decay or the ſmalleſt change in any of its qualities; if it be not eternal, we ſhall be obliged to find a cauſe for its exiſtence, or at leaſt for its form and all its powers. But ſuch a cauſe may have produced the firſt human pair, and undoubtedly did produce them, without making them ſpring as plants from the ſoil. Indeed the growth of plants themſelves clearly evinces a cauſe ſuperior to any vegetative power which can be ſuppoſed inherent in the earth. No plant can be propagated but from ſeed or ſlips from the parent ſtock; but when one contemplates the regular proceſs of vegetation, the exiſtence of every plant implies the prior exiſtence of a parent ſeed, and the exiſtence of every ſeed the prior exiſtence of a parent plant. Which then of theſe, the oak or the acorn, was the firſt, and whence was its exiſtence derived? Not from the earth: for we have the evidence of univerſal experience that the earth never produces a tree but from ſeed, nor ſeed but from a tree. There muſt therefore be ſome ſuperior power which formed the firſt ſeed or the firſt tree, planted it in the earth, and gave to it thoſe powers of vegetation by which the ſpecies has been propagated to this day.

24 and vegetables,

25 and from the laws of attraction and repulſion, &c.

Thus clearly do the proceſſes of generation and vegetation indicate a power ſuperior to thoſe which are uſually called *the powers of nature.* The ſame thing appears no leſs evident from the laws of attraction and repulſion, which plainly prevail through the whole ſyſtem of matter, and hold together the ſtupendous ſtructure. Experiment ſhows that very few particles of the moſt ſolid body are in actual contact with each other (ſee OPTICS, N° 63—68. PHYSICS, N° 23.); and that there are conſiderable interſtices between the particles of every elaſtic fluid, is obvious to the ſmalleſt reflection. Yet the particles of ſolid bodies ſtrongly cohere, whilſt thoſe of elaſtic fluids repel each other. How are theſe phenomena accounted for? To ſay that the former is the effect of attraction and the latter of repulſion, is only to ſay that two individual phenomena are ſubject to thoſe laws which prevail through the whole of the claſſes under which they are reſpectively arranged; whilſt the queſtion at iſſue is concerning the ORIGIN OF THE LAWS THEMSELVES, the *power* which makes the particles of gold cohere, and thoſe of air repel each other. Power without ſubſtance is inconceivable; and by a law of human thought, no man can believe a being to operate but where it is in ſome manner or other actually preſent: but the particles of gold adhere, and the particles of air keep at a diſtance from each other, by powers exerted where no matter is preſent. There muſt therefore be ſome ſubſtance endowed with power which is not material.

Of this ſubſtance or being the power is evidently immenſe. The earth and other planets are carried round the ſun with a velocity which human imagination can ſcarcely conceive. That this motion is not produced by the agency of theſe vaſt bodies on one another, or by the interpoſition of any material fluid, has been ſhown elſewhere (ſee METAPHYSICS, N° 196—200. and OPTICS, N° 67.); and ſince it is a law of our beſt philoſophy, *that we are not to multiply ſubſtances without neceſſity*, we muſt infer that the ſame Being which formed the firſt animals and vegetables, endowing them with powers to propagate their reſpective kinds, is likewiſe the cauſe of all the phenomena of nature, ſuch as *coheſion*, *repulſion*, *elaſticity*, and *motion*, even the motions of the heavenly bodies themſelves.

If this powerful Being be ſelf-exiſtent, intelligent, and independent in his actions and volitions, he is an original or firſt cauſe, and that Being whom we denominate GOD. If he be not ſelf-exiſtent and independent, there muſt be a cauſe in the order of nature prior and ſuperior to Him, which is either itſelf the firſt cauſe, or a link in that ſeries of cauſes and effects, which, however vaſt we ſuppoſe it, muſt be traced ultimately to ſome one Being, who is ſelf-exiſtent, and has in himſelf the power of beginning motion, independent of every thing but his own intelligence and volition. In vain have Atheiſts alledged, that the ſeries may aſcend infinitely, and for that reaſon have no firſt mover or cauſe.

26 Abſurdity of an infinite ſeries of effects.

An infinite ſeries of ſucceſſive beings involves an abſurdity and contradiction (ſee METAPHYSICS, N° 288.): but not to inſiſt on this at preſent, we ſhall only beg leave to conſider ſuch a ſeries as a whole, and ſee what conſequences will flow from the ſuppoſition. That we may with logical propriety conſider it in this light, is incontrovertible; for the birth of each individual of the human race ſhows that it is made up of parts; but parts imply a whole as neceſſarily as an attribute implies its ſubject. As in this ſuppoſed ſeries there is no cauſe which is not likewiſe an effect, nor any body moving another which was not itſelf moved by a third, the whole is undeniably equivalent to an infinite effect, or an infinite body moved: but if a finite effect muſt neceſſarily have proceeded from a cauſe, and a finite body

in

Being and Attributes of God.

in motion must have been put into that state by a mover, is there a human mind which can conceive an infinite effect to have proceeded from *no* cause, or an infinite body in motion to have been moved by *nothing?* No, surely! An infinite effect, were such a thing possible, would compel us to admit an infinite cause, and an infinite body in motion a mover of infinite power.

This great cause is God, whose wisdom, power, and goodness, all nature loudly proclaims. That the phenomena which we daily see evince the existence of *one* such Being, has just been shown; and that we have no reason to infer the existence of *more* than one, is very evident. For, not to lay more stress than it will bear on that rule of Newton's, which forbids us to multiply substances without necessity, such a harmony prevails through the whole visible universe, as plainly shows it to be under the government of one intelligence. That on this globe the several elements serve for nourishment to plants, plants to the inferior animals, and animals to man; that the other planets of our system are probably inhabited, and their inhabitants nourished in the same or a similar manner; that the sun is so placed as to give light and heat to all, and by the law of gravitation to bind the whole planets into one system with itself—are truths so obvious and so universally acknowledged, as to supersede the necessity of establishing them by proof. The fair inference therefore is, that the solar system and all its parts are under the government of *one intelligence*, which directs all its motions and all the changes which take place among its parts for some wise purposes. To suppose it under the government of two or more intelligences would be highly unreasonable; for if these intelligences had equal power, equal wisdom, and the same designs, one of them would evidently be superfluous; and if they had equal power and contrary designs, they could not be the parents of that harmony which we clearly perceive to prevail in the system.

27 There is only one original cause.

But the Being capable of regulating the movements of so vast a machine, may well be supposed to possess infinite power, and to be capable of superintending the motions of the universe. That the widely extended system of nature is but one system, of which the several parts are united by many bonds of mutual connection, has been shown elsewhere (see Physics), and appears daily more and more evident from our progress in physical discoveries; and therefore it is in the highest degree unreasonable to suppose that it has more than one author, or one supreme governor.

28 Of infinite power, wisdom, and

As the unity of design apparent in the works of creation plainly proves the unity of their Author, so do the immensity of the whole, and the admirable adjustment of the several parts to one another, demonstrate His power and His wisdom. On this subject the following beautiful reflections by Mr Wollaston are deserving of the most serious attention.

* *Religion of Nature*, sect. v. prop. 14.

"In order (says that able writer *) to prove to any one the grandness of this fabric of the world, one needs only to bid him consider the *sun*, with that insupportable glory and lustre that surrounds it; to demonstrate its vast distance, magnitude, and heat; to represent to him the chorus of planets moving periodically, by uniform laws, in their several orbits about it; guarded some of them by secondary planets, and as it were emulating the state of the sun, and probably all possessed by proper inhabitants; to remind him of those surprising visits which the *comets* make to us, and the large trains of uncommon splendor which attend them, the far country from which they come, and the curiosity and horror which they excite not only among us, but in the inhabitants of other planets, who may also be up to see the entry and progress of these ministers of fate; to direct his eye and contemplation through those azure fields and vast regions above him up to the *fixed stars*, that radiant numberless host of heaven; and to make him understand how unlikely a thing it is that they should be placed there only to adorn and bespangle a canopy over our heads; to convince him that they are rather so many *other suns*, with their several systems of planets about them; to show him by the help of glasses still more and more of these fixed lights, and to beget in him an apprehension of their inconceivable numbers, and those immense spaces that lie beyond our reach and even our imagination: One needs but to do this (continues our author), and explain to him such things as are now known almost to every body; and by it to show, that if the world be not infinite, it is *infinito similis*, and undoubtedly the work of an Infinite Architect.

"But if we would take a view of all the *particulars* contained within that astonishing compass which we have thus hastily run over, how would wonders multiply upon us? Every corner, every part of the world, is as it were made up of *other* worlds. If we look upon this our earth, what scope does it furnish for admiration? The great variety of mountains, hills, valleys, plains, rivers, seas, trees, and plants! The many tribes of different animals with which it is stocked; the multifarious inventions and works of one of these, *i. e.* of us men; with the wonderful instincts of others, guiding them uniformly to what is best for themselves, in situations where neither sense nor reason could direct them. And yet when all these (heaven and earth) are surveyed as nicely as they can be by the help of our unassisted senses and of telescopes, we may discover by the assistance of good microscopes, in very small parts of matter, as many *new* wonders as those already discovered, new kingdoms of animals, with new and curious architecture. So that as our senses and even conception fainted before in the vast journeys we took in considering the expanse of the universe, they here again fail us in our researches into the principles and minute parts of which it is composed. Both the *beginnings* and the *ends* of things, the *least* and the *greatest*, all conspire to baffle us; and which way soever we prosecute our inquiries, we still meet with fresh subjects of amazement, and fresh reasons to believe that there are indefinitely more and more behind, that will forever escape our eagerest pursuits and deepest penetration.

"In this vast assemblage, and amidst all the multifarious motions by which the several processes of generation and corruption, and the other phenomena of nature, are carried on, we cannot but observe that there are stated methods, as so many forms of proceeding, to which things punctually and religiously adhere. The same *causes* circumstanced in the same manner produce always the same *effects*; all the *species* of animals among us are made according to one general *idea*; and so are those of *plants* also, and even of *minerals*. No new species are brought forth or have arisen anywhere; and the old are preserved and continued by the *old ways*.

"It appears, lastly, beyond dispute, that in the part and

Being and Attributes of God.

and model of the world there is a contrivance for accomplishing certain ends. The sun is placed near the centre of our system, for the more convenient dispensing of his benign influences to the planets moving about him; the place of the earth's *equator* intersects that of her *orbit*, and makes a proper angle with it, in order to diversify the *year*, and create an useful variety of *seasons;* and many other things of this kind will be always observed, and though a thousand times repeated, be meditated upon with pleasure by good men and true philosophers. Who can observe the vapours to ascend, especially from the sea, meet above in clouds, and fall again after condensation, without being convinced that this is a kind of *distillation*, in order to clear the water of its grosser salts, and then by rains and dews to supply the fountains and rivers with fresh and wholesome liquor; to nourish the vegetables below by showers, which descend in drops as from a *watering-pot* upon a garden? Who can view the *structure* of a plant or animal, the indefinite number of its fibres and fine vessels, the formation of larger vessels, and the several members out of them, with the apt disposition of all these; the means contrived for the reception and distribution of *nutriment*; the *effect* this nutriment has in extending the vessels, bringing the vegetable or animal to its full growth and expansion, continuing the *motion* of the several fluids, repairing the decays of the body, and preserving *life?* Who can take notice of the several *faculties* of animals, their arts of saving and providing for themselves, or the ways in which they are provided for; the uses of plants to animals, and of some animals to others, particularly to mankind; the care taken that the several species should be propagated, without confusion, from their proper seeds; the strong inclination planted in animals for that purpose, their love of their young and the like.—Who (says our author) can observe all this, and not see a *design* in such *regular* pieces, so nicely wrought and so admirably preserved? If there were but one animal in existence, and it could not be doubted but that his eyes were formed that he might see with them, his ears that he might hear with them, and his feet to be instruments by which he might remove himself from place to place; if *design* and *contrivance* can be much less doubted, when the same things are repeated in the individuals of all the tribes of animals; if the like observations be made with respect to vegetables and other things; and if all these *classes* of things, and much more the *individuals* comprehended under them, be inconceivably numerous, as most unquestionably they are—one cannot but be convinced, from what so plainly runs through the nobler parts of the visible world, that not only *they*, but other things, even those that seem to be *less noble*, have their ends likewise, though not always perceived by capacities limited like ours. And since we cannot, with the Epicureans of old, suppose the parts of matter to have *contrived* among themselves this wonderful form of a world, to have taken by agreement each its respective *post*, and then to have pursued in conjunction constant *ends* by certain methods and measures *concerted*, there must be some other Being, whose wisdom and power are equal to such a mighty work as is the *structure* and *preservation* of the world. There must be some Almighty MIND who modelled and preserves it; lays the causes of things so deep; prescribes them such uniform and steady laws; destines and adapts them to certain purposes; and makes one thing to fit and answer another so as to produce one harmonious whole. Yes,

> These are thy glorious works, Parent of good!
> Almighty, thine this universal frame,
> Thus wondrous fair; THYSELF how wondrous then!

How wondrous in wisdom and in power!"

29 goodness.

But the GOODNESS of God is not less conspicuous in his works than His power or His wisdom. Contrivance proves design, and the predominant tendency of the contrivances indicates the disposition of the designer. "The world (says an elegant and judicious writer *) abounds with contrivances, and all the contrivances in it with which we are acquainted are directed to beneficial purposes. Evil no doubt exists; but it is never that we can perceive the object of contrivance. Teeth are contrived to eat, not to ache; their aching now and then is incidental to the contrivance, perhaps inseparable from it; but it is not its object. This is a distinction which well deserves to be attended to. In describing implements of husbandry, one would hardly say of a sickle that it is made to cut the reaper's fingers, though from the construction of the instrument, and the manner of using it, this mischief often happens. But if he had occasion to describe instruments of torture or execution, this, he would say, is to extend the sinews; this to dislocate the joints; this to break the bones; this to scorch the soles of the feet. Here pain and misery are the very objects of the contrivance. Now nothing of this sort is to be found in the works of nature. We never discover a train of contrivance to bring about an evil purpose. No anatomist ever discovered a system of organization calculated to produce pain and disease; or, in explaining the parts of the human body, ever said, this is to irritate, this to inflame, this duct is to convey the gravel to the kidneys, this gland to secrete the humour which forms the gout. If by chance he come to a part of which he knows not the use, the most that he can say is, that to him it appears to be useless: no one ever suspects that it is put there to incommode, to annoy, or to torment. If God had wished our misery, he might have made sure of his purpose, by forming our senses to be as many sores and pains to us as they are now instruments of gratification and enjoyment; or, by placing us among objects so ill suited to our perceptions as to have continually offended us, instead of ministering to our refreshment and delight. He might have made, for instance, every thing we tasted bitter, every thing we saw loathsome, every thing we touched a sting, every smell a stench, and every sound a discord."

* Dr Paley.

Instead of this, all our sensations, except such as are excited by what is dangerous to our health, are pleasures to us: The view of a landscape is pleasant; the taste of nourishing food is pleasant; sounds not too loud are agreeable, while musical sounds are exquisite; and scarcely any smells, except such are excited by effluvia obviously pernicious to the brain, are disagreeable; while some of them, if not too long indulged, are delightful. Our lives are preserved and the species is continued by obeying the impulse of appetites; of which the gratification is exquisite when not repeated too frequently, to answer the purposes of the Author of our being. Since, then, God has called forth his consummate

Being and Attributes of God.

mate wisdom to contrive and provide for our happiness, and has made those things which are necessary to our existence and the continuance of the race sources of our greatest sensual pleasures, who can doubt but that benevolence is one of his attributes; and that, if it were not impious to draw a comparison between them, it is the attribute in which he himself most delighteth?

But it is not from sensation only that we may infer the benevolence of the Deity: He has formed us with minds capable of intellectual improvement, and he has implanted in the breast of every man a very strong desire of adding to his knowledge. This addition, it is true, cannot be made without labour; and at first the requisite labour is to most people irksome: but a very short progress in any study converts what was irksome into a pleasure of the most exalted kind; and he who by study, however intense, enlarges his ideas, experiences a complacency, which, though not so poignant perhaps as the pleasures of the sensualist, is such as endears him to himself, and is what he would not exchange for any thing else which this world has to bestow, except the still sweeter complacency arising from the consciousness of having discharged his duty.

That the practice of virtue is attended with a peculiar pleasure of the purest kind, is a fact which no man has ever questioned, though the immediate source of that pleasure has been the subject of many disputes. He who attributes it to a moral sense, which instinctively points out to every man his duty, and on the performance of it rewards him with a sentiment of self-approbation, must of necessity acknowledge benevolence to be one of the attributes of that Being who has so constituted the human mind. That to protect the innocent, relieve the distressed, and do to others as we would in like circumstances wish to be done by, fills the breast, previous to all reflection, with a holy joy, as the commission of any crime tears it with remorse, cannot indeed be controverted. Many, however, contend, that this joy and this remorse spring not from any moral instinct implanted in the mind, but are the consequence of early and deep-rooted associations of the practice of virtue with the hope of future happiness, and of vice with the dread of future misery. On the respective merits of these two theories we shall not now decide, but only observe, that they both lead with equal certainty to the benevolence of the Deity, who made us capable of forming associations, and subjected these associations to fixed laws. This being the case, the moral sense, with all its instantaneous effects, affords not a more convincing proof of his goodness, than that principle in our nature by which remote circumstances become so linked together, that the one circumstance never occurs without bringing the other also into view. It is thus that the pleasing complacency, which was perhaps first excited by the hopes of future happiness, comes in time to be so associated with the consciousness of virtuous conduct, the only thing entitled to reward, that a man never performs a meritorious action without experiencing the most exquisite joy diffused through his mind, though his attention at that instant may not be directed either to heaven or futurity. Were we obliged, before we could experience this joy, to estimate by reason the merit of every individual action, and trace its connection to heaven and future happiness through a long train of intermediate reasoning, we should be in a great measure deprived of the present reward of virtue; and therefore this associating principle contributes much to our happiness. But the benevolence of a Being, who seems thus anxious to furnish us with both sensual and intellectual enjoyments, and who has made our duty our greatest pleasure, cannot be questioned; and therefore we must infer, that the Author of Nature wishes the happiness of the whole sensible and intelligent creation.

30 Objections.

To such reasoning as this in support of the Divine Benevolence many objections have been made. Some of them appear at first sight plausible, and are apt to stagger the faith of him who has bestowed no time on the study of that branch of general science which is called *physics* (see PHYSICS). To omit these altogether in such an article as this might be construed into neglect; while it is certain that there is in them nothing worthy the attention of that man who is qualified either to estimate their force, or to understand the arguments by which they have often been repelled.

31 answered.

It has been asked, Why, if the Author of Nature be a benevolent Being, are we necessarily subject to pain, diseases, and death? The scientific physiologist replies, Because from these evils Omnipotence itself could not in our present state exempt us, but by a constant series of miracles. He who admits miracles, knows likewise that mankind were originally in a state in which they were not subject to death; and that they fell under its dominion through the fault of their common progenitors. But the fall and restoration of man is the great subject of revealed religion; and at present we are discussing the question like philosophers who have no other data on which to proceed than the phenomena of nature. Now we know, that as all matter is divisible, every system composed of it must necessarily be liable to decay and dissolution; and our material system would decay and be dissolved long before it could serve the purposes of nature, were there not methods contrived with admirable wisdom for repairing the waste occasioned by perpetual friction. The body is furnished with different fluids, which continually circulate through it in proper channels, and leave in their way what is necessary to repair the solids. These again are supplied by food *ab extra;* and to the whole processes of digestion, circulation, and nutrition, the air we breathe is absolutely necessary. But as the air is a very heterogeneous fluid, and subject to violent and sudden changes, it is obvious that these changes must affect the blood, and by consequence the whole frame of the human body. The air indeed in process of time consumes even marble itself; and therefore we cannot wonder, that as it is in one state the parent of health, it should in another be the source of disease to such creatures as man and other terrestrial animals. Nor could these consequences be avoided without introducing others much more deplorable. The world is governed by general laws, without which there could be among men neither arts nor sciences; and though laws different from those by which the system is at present governed might perhaps have been established, there is not the smallest reason to imagine that they could on the whole have been better, or attended with fewer inconveniencies. As long as we have material and solid bodies capable of motion, liable to resistance from other solid bodies, supported by food,

subject to the agency of the air, and divisible, they must necessarily be liable to pain, disease, corruption, and death, and that too by the very influence of those laws which preserve the order and harmony of the universe. Thus gravitation is a general law so good and so necessary, that were it for a moment suspended, the world would instantly fall to pieces; and yet by means of this law the man must inevitably be crushed to death on whom a tower shall chance to tumble. Again, the attraction of cohesion is a general law, without which it does not appear that any corporeal system could possibly exist: it is by this law too, or a modification of it, that the glands and lacteals of the human body extract from the blood such particles as are necessary to nourish the solids; and yet it is by means of the very same modification of the very same law that a man is liable to be poisoned.

32 Sickness, pain, and the dread of death serve good purposes.

Although the human body could not have been preserved from dangers and dissolution but by introducing evils greater on the whole than those to which it is now liable, why, it has sometimes been asked, is every disorder to which it is subject attended with sickness or with pain? and why is such a horror of death implanted in our breasts, seeing that by the laws of nature death is inevitable? We answer, That sickness, pain, and the dread of death, serve the very best purposes. Could a man be put to death, or have his limbs broken without feeling pain, the human race had long ago been extinct. Felt we no uneasiness in a fever, we should be insensible of the disease, and die before we suspected our health to be impaired. The horror which generally accompanies our reflections on death tends to make us more careful of life, and prevents us from quitting this world rashly when our affairs prosper not according to our wishes. It is likewise an indication that our existence does not terminate in this world; for our dread is seldom excited by the prospect of the pain which we may suffer when dying, but by our anxiety concerning what we may be doomed to suffer or enjoy in the next stage of our existence; and this anxiety tends more perhaps than any thing else to make us live while we are here in such a manner as to ensure our happiness hereafter.

Thus from every view that we can take of the works and laws of God, and even from considering the objections which have sometimes been made to them, we are compelled to acknowledge the benevolence of their Author. We must not, however, suppose the Divine benevolence to be a fond affection like that which is called benevolence among men. All human affections and passions originate in our dependence and wants; and it has been doubted whether any of them be at first disinterested (see PASSION): but he to whom existence is essential cannot be dependent; he who is the Author of every thing can feel no want. The divine benevolence therefore must be wholly disinterested, and of course free from those partialities originating in self-love, which are alloys in the most sublime of human virtues. The most benevolent man on earth, though he wishes the happiness of every fellow-creature, has still, from the ties of blood, the endearments of friendship, or, perhaps from a regard to his own interest, some particular favourites whom, on a competition with others, he would certainly prefer. But the equal Lord of all can have no particular favourites. His benevolence is therefore coincident with justice; or, that which is called *divine justice*, is only benevolence exerting itself in a particular manner for the propagation of general felicity. When God prescribes laws for regulating the conduct of his intelligent creatures, it is not because he can reap any benefit from their obedience to those laws, but because such obedience is necessary to their own happiness; and when he punishes the transgressor, it is not because in his nature there is any disposition to which the prospect of such punishment can afford gratification, but because in the government of free agents punishment is necessary to reform the criminal, and to intimidate others from committing the like crimes.

33 The divine benevolence coincident with justice.

The essence of this self-existent, all-powerful, infinitely wise, and perfectly good Being, is to us wholly incomprehensible. That it is not matter, is shown by the process of argumentation by which we have proved it to exist: but what it is we know not, and it would be impious presumption to inquire. It is sufficient for all the purposes of religion to know that God is some how or other present to every part of his works; that existence and every possible perfection is essential to him; and that he wishes the happiness of all his creatures. From these truths we might proceed to illustrate the perpetual superintendance of his providence, both general and particular, over every the minutest part of the universe: but that subject has been discussed in a separate article; to which, therefore, we refer the reader. (see PROVIDENCE). We shall only observe at present, that the manner in which animals are propagated affords as complete a proof of the constant superintendance of divine power and wisdom, as it does of the immediate exertion of these faculties in the formation of the parent pair of each species. For were propagation carried on by *necessary* and mechanical laws, it is obvious, that in every age there would be generated, in each species of animals, the very same proportion of males to females that there was in the age preceding. On the other hand, did generation depend on *fortuitous* mechanism, it is not conceivable but that, since the beginning of the world, several species of animals should in *some* age have generated nothing but *males*, and others nothing but *females;* and that of course many species would have been long since extinct. As neither of these cases has ever happened, the preservation of the various species of animals, by keeping up constantly in the world a due, though not always the same, proportion between the sexes of male and female, is a complete proof of the superintendance of divine providence, and of that saying of the apostle, that it is "in God we live, move, and have our being."

34 God incomprehensible.

35 but constantly present to his works.

SECT. II. *Of the Duties and Sanctions of Natural Religion.*

36 Reverence and gratitude due to God.

FROM the short view that we have taken of the divine perfections, it is evidently our duty to reverence in our minds the self-existent Being to whom they belong. This is indeed not only a duty, but a duty of which no man who contemplates these perfections, and believes them to be real, can possibly avoid the performance. He who thinks irreverently of the Author of nature, can never have considered seriously the power, the wisdom, and the goodness, displayed in his works; for whoever has a tolerable notion of these must be convinced, that he who performed them has no imperfection;

Duties and Sanctions of Natural Religion.

tion; that his power can accomplish every thing which involves not a contradiction; that his knowledge is intuitive, and free from the possibility of error; and that his goodness extends to all without partiality and without any alloy of selfish design. This conviction must make every man on whose mind it is impressed ready to prostrate himself in the dust before the Author of his being; who, though infinitely exalted above him, is the source of all his enjoyments, constantly watches over him with paternal care, and protects him from numberless dangers. The sense of so many benefits must excite in his mind a sentiment of the liveliest gratitude to him from whom they are received, and an ardent wish for their continuance.

37 Of whom no positive idea should be formed.

While silent gratitude and devotion thus glow in the breast of the contemplative man, he will be careful not to form even a mental image of that all-perfect Being to whom they are directed. He knows that God is not material; that he exists in a manner altogether incomprehensible; that to frame an image of him would be to assign limits to what is infinite; and that to attempt to form a positive conception of him would be impiously to compare himself with his Maker.

38 How he ought to be spoken of; and

The man who has any tolerable notion of the perfections of the Supreme Being will never speak lightly of him, or make use of his name at all but on great and solemn occasions. He knows that the terms of all languages are inadequate and improper, when applied directly to him who has no equal, and to whom nothing can be compared; and therefore he will employ these terms with caution. When he speaks of his mercy and compassion, he will not consider them as feelings wringing the heart like the mercy and compassion experienced by man, but as rays of pure and disinterested benevolence. When he thinks of the stupendous system of nature, and hears it, perhaps, said that God formed it for his own glory, he will reflect that God is so infinitely exalted above all his creatures, and so perfect in himself, that he can neither take pleasure in their applause, nor receive any accession of any kind from the existence of ten thousand worlds. The immense fabric of nature therefore only displays the glory or perfections of its Author to *us* and to other *creatures* who have not faculties to comprehend him in himself.

39 What is meant by serving him.

When the contemplative man talks of *serving* God, he does not dream that his services can increase the divine felicity; but means only that it is his duty to obey the divine laws. Even the pronoun *He*, when it refers to God, cannot be of the same import as when it refers to man; and by the philosophical divine it will seldom be used but with a mental allusion to this obvious distinction.

As the man who duly venerates the Author of his being will not speak of him on trivial occasions, so will he be still further from calling upon him to witness impertinences and falsehood, (see OATH). He will never mention his name but with a *pause*, that he may have time to reflect in silence on his numberless perfections, and on the immense distance between himself and the Being of whom he is speaking. The slightest reflection will convince him that the world with all that it contains depends every moment on that God who formed it; and this conviction will compel him to wish for the divine protection of himself and his friends from all dangers and misfortunes. Such a wish is in effect a prayer, and will always be accompanied with adoration, confession, and thanksgiving (see PRAYER). But adoration, confessions, supplication, and thanksgiving, constitute what is called *worship*, and therefore the worship of God is a natural duty. It is the addressing of ourselves as his dependants to him as the supreme cause and governor of the world, with acknowledgements of what we enjoy, and petitions for what we really want, or he knows to be convenient for us. As if, ex. gr. I should in some humble and composed manner (says Mr Wollaston) pray to that "Almighty Being, upon whom depends the existence of the world, and by whose providence I have been preserved to this moment, and enjoyed many undeserved advantages, that he would graciously accept my grateful sense and acknowledgments of all his beneficence towards me; that he would deliver me from the evil consequences of all my transgressions and follies; that he would endue me with such dispositions and powers as may carry me innocently and safely through all future trials, and may enable me on all occasions to behave myself conformably to the laws of reason piously and wisely; that He would suffer no being to injure me, no misfortunes to befal me, nor me to hurt myself by any error or misconduct of my own; that he would vouchsafe me clear and distinct perceptions of things; with so much health and prosperity as may be good for me; that I may at least pass my time in peace, with contentment and tranquillity of mind; and that having faithfully discharged my duty to my family and friends, and endeavoured to improve myself in virtuous habits and useful knowledge, I may at last make a decent and happy exit, and find myself in some better state."

40 Divine worship a natural duty.

That an untaught savage would be prompted by *instinct* to address the Supreme Being in such terms as this, we are so far from thinking, that to us it appears not probable that such a savage, in a state of solitude, would be led by instinct to suppose the existence of that Being. But as soon as the being and attributes of God were, by whatever means, made known to man, every sentiment expressed in this prayer must necessarily have been generated in his mind; for not to be sensible that we derive our existence and all our enjoyments from God, is in effect to deny his being or his providence; and not to feel a wish that he would give us what we want, is to deny either his goodness or his power.

The worship of God therefore is a natural duty resulting from the contemplation of his attributes and a sense of our own dependence. But the reasoning which has led us to this conclusion respects only *private* devotion; for it is a question of much greater difficulty, and far enough from being yet determined, whether *public* worship be a duty of that religion which can with any propriety be termed *natural*. Mr Wollaston indeed positively affirms that it is, and endeavours to prove his position by the following arguments.

41 Whether or not is public worship a duty of natural religion?

42 Arguments for it,

"A man (says he) may be considered as a member of some society; and as *such* he ought to worship God if he has the opportunity of doing it, if there be proper prayers used publicly to which he may resort, and if his health, &c. permit. Or the society may be considered as *one body*, that has common interests and concerns, and *as such* is obliged to worship the Deity, and offer one prayer. Besides, there are many who know not of themselves

Duties and Sanctions of Natural Religion.

themselves how to pray; perhaps cannot so much as read. These must be taken *as they are;* and consequently some time and place *appointed* where they may have suitable prayers read to them, and be guided in their devotions. And further, towards the keeping mankind in order, it is *necessary* there should be some religion professed, and even established, which cannot be without public worship. And were it not for that sense of virtue which is *principally* preserved (so far as it is preserved) by national *forms* and *habits* of religion, men would soon lose it *all*, run wild, prey upon one another, and do what else the worst of savages do."

These are in themselves just observations, and would come with great force and propriety from the tongue or pen of a Christian preacher, who is taught by revelation that the Master whom he serves has commanded his followers "not to forsake the assembling of themselves together," and has promised, "that if two of them shall agree on earth as touching any thing that they shall ask, it shall be done for them of his Father who is in heaven." As urged by such a man, and on such grounds, they would serve to show the fitness of the divine command, and to point out the benefits which a religious obedience to it might give us reason to expect. But the author is here professing to treat of *natural* religion, and to state the duties which result from the mere relation which subsists between man as a creature and God as his creator and constant preserver. Now, though we readily admit the benefits of public worship as experienced under the Christian dispensation, we do not perceive any thing in this reasoning which could lead a pious theist to expect the same benefit previous to all experience. When the author thought of *national forms* and *establishments of religion*, he certainly lost sight of his proper subject, and, as such writers are too apt to do, comprehended under the religion of nature what belongs only to that which is revealed. Natural religion, in the proper sense of the words, admits of no particular *forms*, and of no *legal establishment*. Private devotion is obviously one of its duties, because sentiments of adoration, confession, supplication, and thanksgiving, necessarily spring up in the breast of every man who has just notions of God and of himself: but it is not so obvious that such notions would induce any body of men to meet at *stated times* for the purpose of expressing their devotional sentiments in public. Mankind are indeed social beings, and naturally communicate their sentiments to each other; but we cannot conceive what should at first have led them to think that public worship at stated times would be acceptable to the self-existent Author of the universe. In case of a famine, or any other calamity in which the whole tribe was equally involved, they might speak of it to each other, inquire into its cause, and in the extremity of their distress join perhaps in one fervent petition, that God would remove it. In the same manner they might be prompted to pour forth occasional ejaculations of public gratitude for public mercies; but it does not follow from these incidental occurrences that they would be led to institute times and places and forms of national worship, as if they believed the omniscient Deity more ready to hear them in public than in private. That the appointment of such times and forms and places is beneficial to society, experience teaches us; and therefore it is the duty, and has been the practice, of the supreme magistrate, in every age and in every civilized country, to provide for the maintenance of the national worship. But this practice has taken its rise, not from the deductions of reason, but either from direct revelation, as among the Jews and Christians; or from tradition, which had its origin in some early revelations, as among the more enlightened Pagans of ancient and modern times.

43 borrowed from revelation.

We hope none of our readers will imagine that we mean, in any degree, to call in question the fitness or the duty of public worship. This is far from our intention; but while we are convinced of the importance and necessity of this duty, we do not apprehend that we lessen its dignity, or detract from the weight of almost universal practice, by endeavouring to derive that practice from its true source, which appears to us to be not human reason, but divine revelation.

44 The practice of virtue a duty of natural religion.

But whatever doubts may be entertained with respect to the origin of public worship, there can be none as to the foundation of moral virtue. Reason clearly perceives it to be the will of our Maker, that each individual of the human race should treat every other individual as, in similar circumstances, he would expect to be treated himself. It is thus only that the greatest sum of human happiness can be produced (see MORAL PHILOSOPHY, N° 17. and 135.); for were all men temperate, sober, just in their dealings, faithful to their promises, charitable to the poor, &c. it is obvious that no miseries would be felt on earth, but the few which, by the laws of corporeal nature, unavoidably result from the union of our minds with systems of matter. But the design of God in forming sentient beings was to communicate to them some portion, or rather some resemblance, of that felicity which is essential to himself; and therefore every action which in its natural tendency co-operates with this design must be agreeable to him, as every action of a contrary tendency must be disagreeable.

45 Cruelty to the inferior animals a sin.

From this reasoning it follows, that we are obliged not only to be just and beneficent to one another, but also to abstain from all unnecessary cruelty to inferior animals. That we have a right to tame cattle, and employ them for the purposes of agriculture and other arts where strength is required, is a position which we believe has seldom been controverted. But if it is the intention of God to communicate a portion of happiness to all his creatures endowed with sense, it is obvious that we sin against him when we subject even the horse or the ass to greater labour than he is able to perform; and this sin is aggravated when from avarice we give not the animal a sufficient quantity of food to support him under the exertions which we compel him to make. That it is our duty to defend ourselves and our property from the ravages of beasts of prey, and that we may even exterminate such beasts from the country in which we live, are truths which cannot be questioned; but it has been the opinion of men, eminent for wisdom and learning, that we have no right to kill an ox or a sheep for *food*, but in consequence of the divine permission to Noah recorded in the ninth chapter of the book of Genesis. Whether this opinion be well or ill founded we shall not positively determine, though the arguments on which it rests are of such a nature as the reasoners of the present day would perhaps find it no easy task to answer; but it cannot admit of a doubt, that, in killing such animals, we are, in duty to *their* Creator and *ours*, bound to put them to the least possible pain. If this be granted, it is still more evident

Duties and Sanctions of Natural Religion.

evident that we act contrary to the divine will when we torture and put to death such animals as are confessedly not injurious to ourselves, or to any thing on which the comforts of life are known to depend. We are indeed far from being convinced with the poet, that insects and reptiles "in mortal sufferance feel as when a giant dies:" but their feelings on that occasion are certainly such, as that, when we wantonly inflict them, we thwart, as far as in our power, the benevolent purpose of the Creator in giving them life and sense. Let it be observed too, that the man who practises needless cruelty to the brute creation is training up his mind for exercising cruelty towards his fellow-creatures, to his slaves if he have any, and to his servants; and, by a very quick progress, to all who may be placed beneath him in the scale of society.

Such are the plain duties of natural religion; and if they were universally practised, it is evident that they would be productive of the greatest happiness which mankind could enjoy in this world, and that piety and virtue would be their own reward. They are however far from being universally practised; and the consequence is, that men are frequently raised to affluence and power by vice, and sometimes sunk into poverty by a rigid adherence to the rules of virtue.

This being the case, there can be no question of greater importance, while there are few more difficult to be answered, than "What are the sanctions by which natural religion enforces obedience to her own laws?" It is not to be supposed that the great body of mankind should, without the prospect of an ample reward, practise virtue in those instances in which such practice would be obviously attended with injury to themselves; nor does it appear reasonable in any man to forego present enjoyment, without the well-grounded hope of thereby securing to himself a greater or more permanent enjoyment in reversion. Natural religion therefore, as a system of doctrines influencing the conduct, is exceedingly defective, unless it affords sufficient evidence, intelligible to every ordinary capacity, of the immortality of the soul, or at least of a future state of rewards and punishments. That it *does* afford this evidence, is strenuously maintained by some deists, and by many philosophers of a different description, who, though they profess Christianity, seem to have some unaccountable dread of being deceived by their bibles in every doctrine which cannot be supported by philosophical reasoning.

46 Natural religion defective in its evidence of a future state.

47 The general expectation of a future state,

One great argument made use of to prove that the immortality of the soul is among the doctrines of natural religion, is the universal belief of all ages and nations that men continue to live in some other state after death has separated their souls from their bodies. "Quod si *omnium consensus naturæ vox est*: omnesque, qui ubique sunt, consentiunt esse aliquid, quod ad eos pertineat, qui vita cesserint: nobis quoque idem existimandum est: et si, quorum aut ingenio, aut virtute animus excellit, eos arbitramur, quia natura optima sunt, cernere naturæ vim maxime: verisimile est, *cum optimus quisque maxime posteritati serviat*, esse aliquid, cujus is post mortem sensum sit habiturus. Sed ut deos esse natura opinamur, qualesque sint, ratione cognoscimus, sic permanere animos arbitramur *consensu nationum omnium* *."

* *Cicer. Tusc. Quest.* lib. i. § 15, 16.

That this is a good argument for the truth of the doctrine, through whatever channel men may have received it, we readily acknowledge; but it appears not to us to be any proof of that doctrine's being the deduction of human reasoning. The popular belief of Paganism, both ancient and modern, is so fantastic and absurd, that it could never have been rationally inferred from what nature teaches of God and the soul. In the Elysium of the Greek and Roman poets, departed spirits were visible to mortal eyes; and must therefore have been clothed with some material vehicle of sufficient density to reflect the rays of light, though not to resist the human touch. In the mythology of the northern nations, as deceased heroes are represented as eating and drinking, they could not be considered as entirely divested of matter; and in every popular creed of idolatry, future rewards were supposed to be conferred, not for private virtue, but for public violence, on heroes and conquerors and the destroyers of nations. Surely no admirer of what is now called natural religion will pretend that these are part of its doctrines; they are evidently the remains of some primeval tradition obscured and corrupted in its long progress through ages and nations.

48 not the offspring of nature.

49 Opinions of the philosophers respecting a future state.

The philosophers of Greece and Rome employed much time and great talents in disquisitions concerning the human soul and the probability of a future state; and if the genuine conclusions of natural religion on this subject are anywhere to be found, one would naturally look for them in the writings of those men whose genius and virtues did honour to human nature. Yet it is a fact, that the philosophers held such notions concerning the substance of the soul and its state after death as could afford no rational support to suffering virtue, (see METAPHYSICS, Part III. chap. 4.). Socrates is indeed an exception. Confining himself to the study of ethics, that excellent person inferred by the common moral arguments (see MORAL PHILOSOPHY, N° 232—246, that the reality of a future state of rewards and punishments is in the highest degree probable. He was not, however, at all times absolutely *convinced* of this important truth; for a little before his death he said to some who were about him, "I am now about to leave this world, and ye are still to continue in it; which of us have the better part allotted us, God only knows *." And again, at the end of his most admired discourse concerning the immortality of the soul, delivered at a time when he must have been serious, he said to his friends who came to pay their last visit, "I would have you to know that I have great hopes that I am now going into the company of good men; yet I would not be too peremptory and confident concerning it †."

* *Plato in Apolog. Soc.*

† *Plato in Phæd.*

Next to Socrates, Cicero was perhaps the most respectable of all the philosophers of antiquity; and he seems to have studied this great question with uncommon care: yet what were his conclusions? After retailing the opinions of various sages of Greece, and showing that some held the soul to be the *heart*; others, the *blood* in the heart; some the *brain*; others, the *breath*; one, that it was *harmony*; another, that it was *number*; one, that it was *nothing* at all; and another, that it was a certain *quintessence* without a name, but which might properly be called ἐντελέχεια—he gravely adds, "Harum sententiarum quæ vera sit, Deus aliquis viderit: quæ verisimillima, magna quæstio est ‡." He then proceeds to give his own opinion; which was, that the soul is part of God.

‡ *Tusc. Quest.* lib. i. § 9, 10, 11.

To us who know by other evidence that the soul is immortal, and that there will be a future state in which all

Duties and Sanctions of Natural Religion.

all the obliquities of the present stall be made straight, the argument drawn from the moral attributes of God, and the unequal distribution of the good things of this life, appears to have the force of demonstration. Yet none of us will surely pretend to say that his powers of reasoning are greater than were those of Socrates and Cicero: and therefore the probability is, that had we been like them destitute of the light of revelation, we should have been disturbed by the same doubts, and have said with the latter, on reading the arguments of the former as detailed by Plato. "Nescio quomodo, dum lego, assentior: cum posui librum, et mecum ipse de immortalitate animorum cœpi cogitare, assensio illa elabitur *."

* *Ibid.*

50 Without the light of revelation we should have doubted like them.

No one, we hope, will suspect us of an impious attempt to weaken the evidence of a future state. God forbid! The expectation of that state is the only support of virtue and religion; and we think the arguments we have stated elsewhere, and referred to on the present occasion, make the reality of it so highly probable, that, though there were no other evidence, he would act a very foolish part who should confine his attention wholly to the present life. But we do not apprehend that we can injure the cause either of virtue or of religion, by confessing, that those arguments which left doubts in the minds of Socrates and Cicero appear not to us to have the force of *complete demonstration* of that life and immortality which our Saviour brought to light through the gospel.

51 Natural religion has no means of certainly reconciling the Deity to sinners.

Were the case, however, otherwise; were the arguments which the light of nature affords for the immortality of the human soul as convincing as any geometrical demonstration—natural religion would still be defective; because it points out no method by which such as have offended God may be restored to his favour, and to the hopes of happiness which by their sin they had lost. That he who knows whereof we are made would show himself placable to sinners, and that he would find some way to be reconciled, might perhaps be reasonably inferred from the consideration of his benevolence displayed in his works. But when we come to inquire more particularly *how* we are to be reconciled, and whether a *propitiation* will be required, *nature* stops short, and expects with impatience the aid of some particular revelation. That God will receive returning sinners, and accept of repentance instead of perfect obedience, cannot be certainly known by those to whom he has not *declared* that he will. For though repentance be the most probable, and indeed the only means of reconciliation which nature suggests; yet whether he, who is of purer eyes than to behold iniquity, will not require something further before he restore sinners to the privileges which they have forfeited, mere human reason has no way of discovering. From nature therefore arises no sufficient comfort to sinners, but anxious and endless solicitude about the means of appeasing the Deity. Hence those different ways of sacrificing, and those numberless superstitions which overspread the heathen world, but which were so little satisfactory to the wiser part of mankind, that, even in those days of darkness, the philosophers frequently declared that, in their opinion, those rites and oblations could avail nothing towards appeasing the wrath of an offended God, or making their prayers acceptable to him. Hence Socrates and one of his disciples are represented by Plato† as expecting a person divinely commissioned to inform them whether sacrifices be acceptable to the deity, and as resolving to offer no more till that person's arrival, which they piously hoped might be at no great distance.

† *In Alcibiades.*

52 These doubts removed by the Scriptures.

This darkness of the pagan world is to us who live under the sunshine of the gospel happily removed by the various revelations contained in the scriptures of the Old and New Testaments. These taken together exhibit such a display of providence, such a system of doctrines, and such precepts of practical wisdom, as the ingenuity of man could never have discovered. The Christian, with the scriptures in his hands, can regulate his conduct by an infallible guide, and rest his hopes on the surest foundation. These scriptures it is now our business to examine.

PART II. OF REVEALED THEOLOGY.

53 Many pretences to revelation,

IN every civilized country the popular system of theology has claimed its origin from divine revelation. The Pagans of antiquity had their augurs and oracles; the Chinese have their inspired teachers Confucius and Fohi: the Hindoos have their sacred books derived from Brahama; the followers of Mahomet have their Koran dictated by an angel; and the Jews and Christians have the scriptures of the Old and New Testaments, which they believe to have been written by holy men of old, who spake and wrote as they were moved by the Holy Ghost.

That the claims of ancient Paganism to a theology derived from heaven, as well as the similar claims of the Chinese, Hindoos, and Mahometans, are ill founded, has been shown in various articles of this work, (see CHINA, HINDOSTAN, MAHOMETANISM, MYTHOLOGY, and POLYTHEISM); whilst under the words RELIGION, REVELATION, and SCRIPTURE, we have sufficiently proved the divine inspiration of the Jewish and Christian scriptures, and of course the divine origin of Jewish and Christian theology. These indeed are not two systems of theology, but parts of one system which was gradually revealed as men were able to receive it; and therefore both scriptures must be studied by the Christian divine.

54 though the Jewish and Christian revelations are alone true.

There is nothing in the sacred volume which it is not of importance to understand; for the whole proceeds from the fountain of truth: but some of its doctrines are much more important than others, as relating immediately to man's everlasting happiness; and these it has been customary to arrange and digest into regular systems, called *bodies* or *institutes* of *Christian theology*. Could these artificial systems be formed with perfect impartiality, they would undoubtedly be useful, for the bible contains many historical details, but remotely related to salvation; and even of its most important truths, it requires more time and attention than the majority of Christians have to bestow, to discover the mutual connection and dependence.

55 Common divisions of revealed theology.

Artificial systems of theology are commonly divided into two great parts, the *theoretic* and the *practical*; and

Revealed Theology.

and these again are subdivided into many inferior branches. Under the theoretic part are sometimes classed,

1. *Dogmatic* theology; which comprehends an entire system of all the dogmas or tenets which a Christian is bound to believe and profess. The truth of these the divine must clearly perceive, and be able to enforce on his audience: and hence the necessity of studying what is called,

2. The *exegesis*, or the art of attaining the true sense of the holy scriptures; and,

3. *Hermeneutic* theology, or the art of interpreting and explaining the scriptures to others; an art of which no man can be ignorant who knows how to attain the true sense of them himself.

4. *Polemical* theology, or controversy; and,

5. *Moral* theology, which is distinguished from moral philosophy, or the simple doctrine of ethics, by teaching a much higher degree of moral perfection than the mere light of reason could ever have discovered, and adding new motives to the practice of virtue.

The practical sciences of the divine are,

1. *Homiletic* or *pastoral* theology; which teaches him to adapt his discourses from the pulpit to the capacity of his hearers, and to pursue the best methods of guiding them by his doctrine and example in the way of salvation.

2. *Catechetic* theology, or the art of teaching youth and ignorant persons the principal points of evangelical doctrine, as well with regard to belief as to practice.

3. *Casuistic* theology, or the science which decides on doubtful cases of moral theology, and that calms the scruples of conscience which arise in the Christian's soul during his journey through the present world.

We have mentioned these divisions and subdivisions of the science of theology, not because we think them important, but merely that our readers may be at no loss to understand the terms when they meet with them in other works. Of such terms we shall ourselves make no use, for the greater part of them indicate distinctions where there is no difference, and tend only to perplex the student. As the truths of Christianity are all contained in the scriptures of the Old and New Testaments, it is obvious that dogmatic theology must comprehend the speculative part of that which is called moral, as well as every doctrine about which controversy can be of importance. But no man can extract a single dogma from the bible but by the practice of what is here called the *exegesis*; so that all the subdivisions of this arrangement of theoretical theology must be studied together as they necessarily coalesce into one. The same thing is true of the three branches into which practical theology is here divided. He who has acquired the art of adapting his homilies to the various capacities of a mixed audience, will need no new study to fit him for instructing children, and the most ignorant persons who are capable of instruction; and the complete master of moral theology will find it no very difficult task to resolve all the cases of conscience which he can have reason to suppose will ever be submitted to his judgement. For these reasons we shall not trouble our readers with the various divisions and subdivisions of theology. Our preliminary directions will show them how we think the science should be studied; and all that we have to do as system-*builders* is to lay before them the view which the scriptures present to us of the being and perfections of God, his various dispensations to man, and the duties thence incumbent on Christians. In doing this, we shall follow the order of the divine dispensations as we find them recorded in the Old and New Testaments, dwelling longest on those which appear to us of most general importance. But as we take it for granted that every reader of this article will have previously read the whole sacred volume, we shall not scruple to illustrate dogmas contained in the Old Testament by texts taken from the New, or to illustrate doctrines peculiar to the Christian religion by the testimony of Jewish prophets.

56 Useless.

God and his Attributes.

Sect. I. *Of God and his Attributes.*

57 The first revelation supposes the being of God to be a known truth.

In every system of theology the first truths to be believed are those which relate to the being and attributes of God. The Jewish lawgiver, therefore, who records the earliest revelations that were made to man, begins his history with a display of the power and wisdom of God in the creation of the world. He does not inform his countrymen, and expect them to believe, on the authority of his divine commission, that God *exists*; for he well knew that the being of God must be admitted, and just notions entertained of his attributes, before man can be required to pay any regard to miracles which afford the only evidence of a primary revelation. "In the beginning (says he) God created the heavens and the earth." Here the being of God is assumed as a truth universally received; but the sentence, short as it is, reveals another, which, as we shall afterwards shew, human reason could never have discovered.

There is nothing which the scriptures more frequently or more earnestly inculcate than the unity of the divine nature. The texts asserting this great and fundamental truth are almost numberless. "Unto thee (says Moses to his countrymen *) it was shewed, that thou mightest know that the Lord is God; there is *none else besides him*. Know therefore that the Lord *he is God* in *heaven above* and upon the *earth beneath*: *there is none else*. And again, "Hear, O Israel, the Lord our God is *one Lord*," or, as it is expressed in the original, "Jehovah our God is one Jehovah," one Being to whom existence is essential, who could not have a beginning and cannot have an end. In the prophecies of Isaiah, God is introduced as repeatedly declaring †, "I am Jehovah, and there is *none else*; there is *no God besides me*; that they may know from the rising of the sun and from the west, that there is *none besides me*: I am *Jehovah*, and there is *none else*: Is there a God besides me? Yea there is *no God*; I know not any." In perfect harmony with these declarations of Moses and the prophets, our Saviour, addressing himself to his Father, says ‡, "This is life eternal, that they might know *Thee*, *the only true God*, and Jesus Christ whom Thou hast sent;" and St Paul, who derived his doctrine from his divine Master, affirms §, that "an idol is nothing in the world; and that there is *none other God but one*."

* Deut iv. 35. and 39, vi. 4.

† Isaiah xiv. 5, 6, 18, 21. xliv. 8.

‡ John xvii. 3.

§ 1 Cor. viii. 4.

The unity of the divine nature, which, from the order and harmony of the world, appears probable to human reason, these texts of revelation put beyond a doubt. Hence the first precept of the Jewish law, and, according to their own writers, the foundation of their whole religion, was, "Thou shalt have none other gods before Me."

God and his Attributes.

Me." Hence, too, the reason of that strict command to Jews and Christians to give divine worship to none but God: "Thou shalt worship the Lord thy God, and him only shalt thou serve;" because he is *God alone*. Him only must we fear, because he alone hath infinite power; in him alone must we trust, because "he only is our rock and our salvation;" and to him alone must we direct our devotions, because "he only knoweth the hearts of the children of men."

58 Denotes a plurality of persons in the Godhead.

The word אלהים does not indicate a plurality of gods. In the opinion, however, of many eminent divines, it denotes, by its junction with the singular verb, a plurality of persons in the one Godhead; and some few have contended, that by means of this peculiar construction, the Christian doctrine of the Trinity may be proved from the first chapter of the book of Genesis. To this latter opinion we can by no means give our assent. That there are three distinct persons in the one divine nature may be inferred with sufficient evidence from a multitude of passages in the Old and New Testaments diligently compared together; but it would perhaps be rash to rest the proof of so sublime a mystery on any single text of holy scripture, and would certainly be so to rest it on the text in question. That Moses was acquainted with this doctrine, we may reasonably conclude from his so frequently making a plural name of God to agree with a verb in the singular number; but had we not possessed the brighter light of the New Testament to guide us, we should never have thought of drawing such an inference. For supposing the word אלהים to denote clearly a plurality of persons, how could we have known that the number is neither more or less than three, had it not been ascertained to us by subsequent revelations?

There are indeed various passages in the Old Testament, of the phraseology of which no rational account can be given, but that they indicate more than one person in the Godhead. Such are those texts already noticed; "and the Lord God said, let US make man in OUR image, after OUR likeness;" and "the Lord God said, behold the man is become like ONE of US." To these may be added the following, which are to us perfectly unintelligible on any other supposition; "and the Lord God said, let US go down, and there confound their language *." "If I be a *Master* (in the Hebrew *adonim*, MASTERS), where is my fear †?" "The fear of the Lord (JEHOVAH) is the beginning of wisdom, and the knowledge of the Holy (in the Hebrew HOLY ONES) is understanding ‡." "Remember thy Creator (Hebrew, thy CREATORS) in the days of thy youth §." "And now the LORD GOD and his SPIRIT hath sent me ‖." "Seek ye out of the book of the LORD and read; for MY mouth it hath commanded, and his SPIRIT it hath gathered them *."

That these texts imply a plurality of divine persons, seems to us incontrovertible. When Moses represents God as saying, let us make man, the majesty of the plural number had not been adopted by earthly sovereigns; and it is obvious that the Supreme Being could not, as has been supposed, call on angels to make man; for in different places of scripture † creation is attributed to God alone. Hence it is that Solomon speaks of Creators in the *plural number*, though he means only the one Supreme Being, and exhorts men to remember them in the days of their youth. In the passage first quoted from Isaiah, there is a distinction made between the *Lord God* and his *Spirit*; and in the other, three divine persons are introduced, viz. the *Speaker*, the *Lord*, and the *Spirit* of the Lord. It does not, however, appear evident from these passages, or from any other that we recollect in the Old Testament, that the persons in Deity are three and no more: but no sober Christian will harbour a doubt but that the precise number was by some means or other made known to the ancient Hebrews; for inquiries leading to it would be naturally suggested by the form in which the high priest was commanded to bless the people. "The LORD bless thee and keep thee. The LORD make his face to shine upon thee, and be gracious unto thee. The LORD lift up his countenance upon thee, and give thee peace *."

* Gen. xi. 6, 7.
† Mal. i. 6.
‡ Prov. ix. 10.
§ Eccl. xii. 1.
‖ Isaiah xlviii. 16.
* Isaiah xxxiv. 16.
† Job ix. 8. Isa. xlv. *passim*.

* Numb. vi. 24, 25, 26.

59 A Trinity in unity the doctrine of scripture.

The form of Christian baptism establishes the truth of the doctrine of the Trinity beyond all reasonable ground of dispute. "Go (says our blessed Saviour) and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost." What was it the apostles were to teach all nations? Was it not to turn from their vanities to the living God; to renounce their idols and false gods, and so to be baptized in the name of the Father, and of the Son, and of the Holy Ghost? What now must occur to the Gentile nations on this occasion, but that, instead of all their deities, to whom they had before bowed down, they were in future to serve, worship, and adore, Father, Son, and Holy Ghost, as the only true and living God? To suppose that GOD and TWO CREATURES are here joined together in the solemn rite by which men were to be admitted into a new religion, which directly condemns all *creature-worship*, would be so unreasonable, that we are persuaded such a supposition never was made by any converted Polytheist of antiquity. The nations were to be baptized in the name of three persons, in the *same manner*, and therefore, doubtless, in the *same sense*. It is not said in the name of GOD and his two faithful *servants*; nor in the name of GOD, and CHRIST, and the HOLY GHOST, which might have suggested a thought that *one* only of the three is God; but in the name of the FATHER, and of the SON, and of the HOLY GHOST. Whatever honour, reverence, or regard, is paid to the first person in this solemn rite, the same is paid to all three. Is he acknowledged as the object of worship? So are the other two likewise. Is he God and Lord over us? So are they. Are we enrolled as subjects, servants, and soldiers, under him? So are we equally under all. Are we hereby regenerated and made the temple of the Father? So are we likewise of the Son and Holy Ghost. "We will come (says our Saviour †) and make our abode with him."

† John xiv. 23.

If those who believe the inspiration of the scriptures could require any further proof that the Godhead comprehends a trinity of persons in one nature, we might urge the apostolical benediction; "The grace of our LORD JESUS CHRIST, and the love of GOD, and the communion of the HOLY GHOST, be with you all ‡." Would St Paul, or any other man of common sense, have in the same sentence, and in the most solemn manner, recommended his Corinthian converts to the love of God, and to the grace and communion of two creatures? We should think it very absurd to recommend a man at once to the favour of a king and a beggar;

‡ 2 Cor. xiii. 14.

God and his Attributes.

gar; but how infinitely ſmall is the diſtance between the greateſt earthly potentate and the meaneſt beggar when compared with that which muſt for ever ſubſiſt between the Almighty Creator of heaven and earth and the moſt elevated creature?

60 Difficulties in this doctrine.

But how, it will be aſked, can three divine perſons be but one and the ſame God? This is a queſtion which has been often put, but which, we believe, no created being can fully anſwer. The divine nature and its manner of exiſtence is, to us, wholly incomprehenſible; and we might with greater reaſon attempt to weigh the mountains in ſcales, than by our limited faculties to fathom the depths of infinity. The Supreme Being is preſent in power to every portion of ſpace, and yet it is demonſtrable, that in his eſſence he is not extended (ſee METAPHYSICS, N° 309, 310). Both theſe truths, his inextenſion and omnipreſence, are fundamental principles in what is called *natural religion;* and when taken together they form, in the opinion of moſt people, a myſtery as incomprehenſible as that of the Trinity in unity. Indeed there is nothing of which it is more difficult to form a diſtinct notion than *unity* ſimple, and abſolutely indiviſible. Though the Trinity in unity, therefore, were no Chriſtian doctrine, myſteries muſt ſtill be believed; for they are as inſeparable from the religion of nature as from that of revelation; and atheiſm involves the moſt incomprehenſible of all myſteries, even the beginning of exiſtence without a cauſe. We muſt indeed form the beſt notions that we can of this and all other myſteries; for if we have no notions whatever of a Trinity in unity, we can neither believe nor diſbelieve that doctrine. It is however to be remembered, that all our notions of God are more or leſs analogical; that they muſt be expreſſed in words which, literally interpreted, are applicable only to man; and that propoſitions underſtood in this literal ſenſe may involve an apparent contradiction, from which the truth meant to be expreſſed by them would be ſeen to be free, had we direct and adequate conceptions of the divine nature. On this account it is to be wiſhed that men treating of the myſtery of the Holy Trinity, had always expreſſed themſelves in ſcripture language, and never aimed at being wiſe above what is written; but ſince they have acted otherwiſe, we muſt, in juſtice to our readers, animadvert on one or two ſtatements of this doctrine, which we have reaſon to believe are earneſtly contended for by ſome who conſider themſelves as the only orthodox.

In the ſcriptures, the three perſons are denominated by the terms FATHER, SON, and HOLY GHOST, or by GOD, the WORD, who is alſo declared to be God, and the SPIRIT OF GOD. If each be truly God, it is obvious that they muſt all have the ſame divine nature, juſt as every man has the ſame human nature with every other man; and if there be but ONE GOD, it is equally obvious that they muſt be of the ſame individual ſubſtance or eſſence, which no three men can poſſibly be. In this there is a difficulty; but, as will be ſeen by and by, there is no contradiction. The very terms FATHER and SON imply ſuch a relation between the two perſons ſo denominated, as that though they are of the ſame ſubſtance, poſſeſſed of the ſame attributes, and equally God, juſt as a human father and his ſon are equally men, yet the ſecond muſt be perſonally ſubordinate to the firſt. In like manner, the HOLY GHOST, who is called the Spirit of God, and is ſaid to *proceed from* the *Father*, and to be *ſent* by the *Son*, muſt be conceived as ſubordinate to both, much in the ſame way as a ſon is ſubordinate to his parents, though poſſeſſed of equal or even of ſuperior powers. That this is the true doctrine, appears to us undeniable from the words of our Saviour himſelf, who, in a prayer addreſſed to his Father, ſtyles him * by way of pre-eminence, "the only true God," as being the fountain or origin of the Godhead from which the Son and the Holy Ghoſt derive their true divinity. In like manner, St Paul, when oppoſing the polytheiſm of the Greeks, ſays expreſsly †, that "to us there is but one God, THE FATHER, OF whom are all things, and we in, or for, him; and one LORD JESUS CHRIST, BY whom are all things, and we by him."

* John xvii. 3.

† 1 Cor. viii. 6.

61 Subordination of the ſecond and third perſons.

That the primitive fathers of the Chriſtian church maintained this ſubordination of the ſecond and third perſons of the bleſſed Trinity to the firſt, has been evinced with complete evidence by Biſhop Bull. We ſhall tranſcribe two quotations from him, and refer the reader for fuller ſatisfaction to *ſect.* 4. of his *Defenſio fidei Nicenæ.* The firſt ſhall be a paſſage cited from *Novatian*, in which the learned prelate aſſures us the ſenſe of all the ancients is expreſſed. "Quia quid eſt Filius, non ex ſe eſt, quia nec innatus eſt; ſed ex patre eſt, quia genitus eſt: ſive dum verbum eſt, ſive dum virtus eſt, ſive dum ſapientia eſt, ſive dum lux eſt, ſive dum Filius eſt, et quicquid horum eſt, non aliunde eſt quam ex Patre, Patri ſuo originem ſuam debens." The next is from Athanaſius, who has never been accuſed of holding low opinions reſpecting the ſecond perſon of the holy Trinity. This father, in his fifth diſcourſe againſt the Arians, ſays, καλα γαρ τον Ιωαννην εν ταυτη τη αρχη ην ὁ λογος και ὁ λογος. ην προς τον θεον. Θεος γαρ εστιν ἡ αρχη, και επειδαν εξ αυτης εστι, δια τουτο και θεος ην ὁ λογος; *according to John, the Word was in this firſt principle, and the Word was God. For God is the principle; and becauſe the Word is from the principle, therefore the Word is God.* Agreeably to this doctrine, the Nicene fathers, in the creed which they publiſhed for the uſe of the univerſal church, ſtyle the only begotten Son, GOD OF GOD, θεος εκ θεου.

62 Denied by ſome modern divines, but

Regardleſs however of antiquity, and of the plain ſenſe of ſcripture, ſome modern divines of great learning contend, that the three perſons in Deity are all *conſubſtantial*, *co-eternal*, *co-ordinate*, without *derivation*, *ſubordination*, or *dependence*, of *any ſort*, as to nature or eſſence; while others affirm, that the ſecond and third perſons derive from the firſt their perſonality, but not their nature. We ſhall conſider theſe opinions as different, though, from the obſcurity of the language in which we have always ſeen them expreſſed, we cannot be certain but they may be one and the ſame. The maintainers of the former opinion hold, that the three perſons called *Elohim* in the Old Teſtament, naturally independent on each other, entered into an agreement before the creation of the world, that one of them ſhould in the fulneſs of time aſſume human nature, for the purpoſe of redeeming mankind from that miſery into which it was foreſeen that they would fall. This antemundane agreement, they add, conſtitutes the whole of that paternal and filial relation which ſubſiſts between the firſt and ſecond perſons whom we denominate Father and Son; and they hold, that the Son is ſaid to be begotten before all worlds, to indicate that *He* who was before all worlds was *begotten*, or to *be* begotten, into the office of

God and his Attributes.

of redeemer; or, more decisively, to signify that he undertook that office before the creation, and *assumed* to himself some appearance or figure of the reality in which he was to execute it; and he is called μονογενης or the only begotten, because he *alone* was begotten into the office of redeemer *.

* See *Ridgeley's Body of Divinity.*

63 The express doctrine of scripture.

To many of our readers we doubt not but this will appear a very extraordinary doctrine, and not easy to be reconciled with the unity of God. It is however sufficiently overturned by two sentences of holy scripture, about the meaning of which there can be no dispute. "In this (says St John †) was manifested the love of God towards us, because that God sent his only begotten Son into the world, that we might live through him." Taking the word *son* in its usual acceptation, this was certainly a wonderful degree of love in the Father of mercies to send into the world on our account a person so nearly related to him as an only son; but if we substitute this novel interpretation of the words *only begotten son* in their stead, the apostle's reasoning will lose all its force. St John will then be made to say, "In this was manifested the love of God toward us, because that God sent a divine person equal to himself, and no way related to him, but who had before the creation covenanted to come into the world, that we might live through him." Is this a proof of the love of the person here called God? Again, the inspired author of the epistle to the Hebrews, treating of our Saviour's priesthood, says, among other things expressive of his humiliation, that "though he was a SON, yet learned he obedience by the things which he suffered ‡." If the word *son* be here understood in its proper sense, this verse displays in a very striking manner the condescension of our divine Redeemer, who, though he was no less a person than the proper Son of God by nature, yet vouchsafed to learn obedience by the things which he suffered; but if we substitute this metaphorical sonship in place of the natural, the reasoning of the author will be very extraordinary. "Though this divine personage agreed before all worlds to suffer death for the redemption of man, yet learned he obedience by the things which he suffered." What sense is there in this argument? Is it a proof of condescension to fulfil one's engagement? Surely, if the meaning of the word *son*, when applied to the second person of the blessed Trinity, were what is here supposed, the inspired writer's argument would have been more to the purpose for which it is brought had it run thus; "Though he was *not* a son, i. e. though he had made no previous agreement, yet condescended he to learn," &c.

† John iv. 9.

‡ Heb. v. 8.

The other opinion, which supposes the Son and the Holy Ghost to derive from the Father their personality, but not their nature, is to us wholly unintelligible; for personality cannot exist, or be conceived in a state of separation from all natures, any more than a quality can exist in a state of separation from all substances. The former of these opinions we are unable to reconcile with the unity of God; the latter is clothed in words that have no meaning. Both, as far as we can understand them, are palpable polytheism; more palpable indeed than that of the Grecian philosophers, who though they worshipped gods many, and lords many, yet all held one God supreme over the rest. See POLYTHEISM, N° 32.

But if the Son and the Holy Ghost derive their nature as well as their personality from the Father, will it not follow that they must be posterior to him in time, since every effect is posterior to its cause? No; this consequence seems to follow only by reasoning too closely from one nature to another, when there is between the two but a very distant analogy. It is indeed true, that among men, every father must be prior in time as well as in the order of nature to his son; but were it essential to a man to be a father, so as that he could not exist otherwise than in that relation, it is obvious that his son would be coeval with himself, though still as proceeding from him, he would be posterior in the order of nature. This is the case with all necessary causes and effects. The visible sun is the immediate and necessary cause of light and heat, either as emitting the rays from his own substance, or as exciting the agency of a fluid diffused for that purpose through the whole system. Light and heat therefore, must be as old as the sun; and had he existed from eternity, they would have existed from eternity with him, though still, as his effects, they would have been behind him in the order of nature. Hence it is, that as we must speak analogically of the Divine nature, and when treating of mind, even the Supreme mind, make use of words literally applicable only to the modifications of matter, the Nicene fathers illustrate the eternal generation of the second person of the blessed Trinity by this procession of light from the corporeal sun, calling him *God* OF *God*, *light* OF *light*.

64 The second and third persons not posterior to the first.

Another comparison has been made use of to enable us to form some notion, however inadequate, how three Divine persons can subsist in the same substance, and thereby constitute but one God. Moses informs us, that man was made after the image of God. That this relates to the soul more than to the body of man, has been granted by all but a few gross anthropomorphites; but it has been well observed *, that the soul, though in itself one indivisible and unextended substance, is conceived as consisting of three principal faculties, the *understanding*, the *memory*, and the *will*. Of these, though they are all coeval in time, and equally essential to a rational soul, the understanding is in the order of nature obviously the first, and the memory the second; for things must be perceived before they can be remembered; and they must be remembered and compared together before they can excite volitions, from being some agreeable, and others disagreeable. The memory therefore may be said to spring from the understanding, and the will from both; and as these three faculties are conceived to constitute one soul, so may three Divine persons partaking of the same individual nature or essence constitute one God.

* *Leslie's Socinian Controversy.*

65 No contradiction in the Catholic doctrine of the Trinity.

These parallels or analogies are by no means brought forward as proofs of the Trinity, of which the evidence is to be gathered wholly from the word of God; but they serve perhaps to help our labouring minds to form the justest notions of that mystery which it is possible for us to form in the present state of our existence; and they seem to rescue the doctrine sufficiently from the charge of contradiction, which has been so often urged against it by Unitarian writers. To the last analogy we are aware it has often been objected, that the soul may as well be said to consist of ten or twenty faculties as of three, since the passions are equally essential to it with the understanding, the memory, and the will, and are as different from one another as these three faculties are.

This,

God and his Attributes.

This, however, is probably a mistake; for the best philosophy seems to teach us, that the passions are not innate; that a man might exist through a long life a stranger to many of them; and that there are probably no two minds in which are generated *all* the passions (see PASSION); but understanding, memory, and will, are absolutely and equally necessary to every rational being. But whatever be in this, if the human mind can be *conceived* to be one indivisible substance, consisting of different faculties, whether many or few, why should it be thought an impossibility for the infinite and eternal nature of God to be communicated to three persons acting different parts in the creation and government of the world, and in the great scheme of man's redemption.

66 Objections.

To the doctrine of the Trinity many objections have been made, as it implies the divinity of the Son and the Holy Ghost; of whom the former assumed our nature, and in it died for the redemption of man. These we shall notice when we come to examine the revelations more peculiarly Christian; but there is one objection which, as it respects the doctrine in general, may be properly noticed here. It is said that the first Christians borrowed the notion of a Triune God from the later Platonists; and that we hear not of a Trinity in the church till converts were made from the school of Alexandria. But if this be the case, we may properly ask, whence had those Platonists the doctrine themselves? It is not surely so simple or so obvious as to be likely to have occurred to the reasoning mind of a Pagan philosopher; or if it be, why do Unitarians suppose it to involve a contradiction? Plato indeed taught a doctrine in some respects similar to that of the Christian Trinity, and so did Pythagoras, with many other philosophers of Greece and the East (see PLATONISM, POLYTHEISM, and PYTHAGORAS); but though these sages appear to have been on some occasions extremely credulous, and on others to have indulged themselves in the most mysterious speculations, there is no room to suppose that they were *naturally weaker men* than ourselves, or that they were capable of inculcating as truths what they *perceived* to involve a *contradiction*. The Platonic and Pythagorean trinities never could have occurred to the mind of him who merely from the works of creation endeavoured to discover the being and attributes of the Creator; and therefore as those philosophers travelled into Egypt and the East in quest of knowledge, it appears to us in the highest degree probable, that they picked up this mysterious and sublime doctrine in those regions where it had been handed down as a dogma from the remotest ages, and where we know that science was not taught systematically, but detailed in collections of sententious maxims and traditionary opinions. If this be so, we cannot doubt but that the Pagan trinities had their origin in some primæval revelation. Nothing else indeed can account for the general prevalence of a doctrine so remote from human imagination, and of which we find vestiges in the sacred books of almost every civilized people of antiquity. The corrupt state in which it is viewed in the writings of Plato and others, is the natural consequence of its descent through a long course of oral tradition; and then falling into the hands of men who bent every opinion as much as possible to a conformity with their own speculations. The trinity of Platonism therefore, instead of being an objection, lends, in our opinion, no feeble support to the Christian doctrine, since it affords almost a complete proof of that doctrine's having made part of the first revelations communicated to man.

67 Answered.

Having thus discovered that the one God comprehends three persons, let us now inquire what this triune God exerted when he created the heaven and the earth. That by the heaven and the earth is here meant the whole universe, visible and invisible, is known to every person acquainted with the phraseology of Scripture; and we need inform no man conversant with English writers, that by *creation*, in its proper sense, is meant bringing into *being* or making that to *exist* which existed not *before*. It must, however, be acknowledged, that the Hebrew word ברא does not always imply the production of substance, but very often the forming of particular organized bodies out of pre-existing matter. Thus when it is said * that "God *created* great whales, and every living creature that moveth, which the waters brought forth abundantly after their kind," and again, "that he *created* man male and female;" though the word ברא is used on both occasions, we are not to conceive that the bodies of the first human pair, and of these animals, were brought into being from nonentity, but only that they were formed by a proper organization being given to pre-existent matter. But when Moses says, "In the beginning God *created* the heaven and the earth," he cannot be supposed to mean, that "in the beginning God only gave form to matter already existing of itself;" for in the very next verse we are assured that after this act of creation was over, "the earth was still *without form* and void," or, in other words, in a chaotic state.

* Gen. i. 21, 27.

68 Creation taught by Moses.

That the Jews, before the coming of our Saviour, understood their lawgiver to teach a proper creation, is plain from that passage in the second book of the Maccabees, in which a mother, to persuade her son to suffer the cruellest tortures rather than forsake the law of his God, uses the following argument: "I beseech thee, my son, look upon the heaven and the earth, and all that is therein, and consider that God made them of things that were not." To the same purpose the inspired author of the epistle to the Hebrews, when magnifying the excellence of faith, says, "Through faith we understand that the worlds were framed by the word of God, so that things which are seen were not made of things which do appear;" where, as Bishop Pearson has ably proved †, the phrase μη εκφαινομενων is equivalent to ουκ εξ οντων, in the quotation from the Maccabees.

† *Exposition of the Creed.*

The very first verse, therefore, of the book of Genesis informs us of a most important truth, which all the uninspired wisdom of antiquity could not discover. It assures us, that as nothing exists by chance, so nothing is necessarily existing but the three divine persons in the one Godhead. Every thing else, whether material or immaterial, derives its substance, as well as its form or qualities, from the fiat of that self existent Being, "who was, and is, and is to come."

69 The whole universe not created at once.

It does not, however, follow from this verse, or from any other passage in the sacred Scriptures, that the whole universe was called into existence at the same instant; neither is it by any means evident that the chaos of our world was brought into being on the first of those six days during which it was gradually reduced into form. From a passage ‡ in the book of Job, in which we are told by God himself, that when the "foundation of the earth

‡ xxxviii. 7.

God and his Attributes.

earth was laid the morning ſtars ſang together, and all the ſons of God ſhouted for joy," it appears extremely probable that worlds had been created, formed, and inhabited, long before our earth had any exiſtence. Nor is this opinion at all contrary to what Moſes ſays of the creation of the ſtars; for though they are mentioned in the ſame verſe with the ſun and moon, yet the manner in which, according to the original, they are introduced, by no means indicates that all the ſtars were formed at the ſame time with the luminaries of our ſyſtem. Moſt of them have been created long before, and ſome of them ſince, our world was brought into being; for that clauſe (verſe 16.) "he made the ſtars alſo," is in the Hebrew no more than "and the ſtars;" the words *he made* being inſerted by the tranſlators. The whole verſe therefore ought to be rendered thus, "and God made two great lights; the greater light to rule the day, and the leſſer light with the ſtars to rule the night; where nothing is intimated with reſpect to the *time* when the ſtars were formed, any more than in that verſe of the Pſalms *, which exhorts us to give thanks to God who made the moon and ſtars to rule by night; for his mercy endureth "for ever." The firſt verſe of the book of Geneſis informs us, that all things ſpiritual and corporeal derive their exiſtence from God; but it is nowhere ſaid that all matter was created at the ſame time.

* Pſalm cxxxvi. 9.

That the whole corporeal univerſe *may have been* created at once muſt be granted; but if ſo, we have reaſon to believe that this earth, with the ſun and all the planets of the ſyſtem, were ſuffered to remain for ages in a ſtate of chaos, "without form and void;" becauſe it appears from other ſcriptures, that worlds of intelligent creatures exiſted, and even that ſome angels had fallen from a ſtate of happineſs prior to the era of the Moſaic coſmogony. That the ſun and the other planets revolving round him were formed at the ſame time with the earth, cannot indeed be queſtioned; for it is not only probable in itſelf from the known laws of nature, but is expreſsly affirmed by the ſacred hiſtorian, who relates the formation of the ſun and moon in the order in which it took place; but there is one difficulty which has furniſhed ignorance with ſomething like an objection to the divine legation of the Hebrew lawgiver, and which we ſhall notice.

70 The ſolar ſyſtem created at once.

71 A difficulty ſolved.

Moſes informs us, that on the *firſt day* after the production of the chaos, the *element of light* was created; and yet within a few ſentences he declares, that the ſun, the fountain of light, was not made till the *fourth day*. How are theſe two paſſages to be reconciled? We anſwer, That they may be reconciled many ways. Moſes wrote for the uſe of a whole people, and not for the amuſement or inſtruction of a few aſtronomers; and in this view his language is ſufficiently proper, even though we ſuppoſe the formation of the ſun and the other planets to have been carried on at the ſame time, and in the ſame progreſſive manner, with the formation of this earth. The voice which called light into exiſtence would ſeparate the fiery and luminous particles of the chaos from thoſe which were opake, and, on this hypotheſis, conſolidate them in one globe, diffuſing an obſcure light through the planetary ſyſtem; but if the earth's atmoſphere continued till the fourth day loaded with vapours, as from the narrative of Moſes it appears to have done, the ſun could not till *that day* have been *ſeen* from the earth, and may therefore, in popular language, be ſaid with ſufficient propriety to have been *formed* on the fourth day, as it was then made to *appear*. (See CREATION, n° 13.) But though this ſolution of the difficulty ſerves to remove the objection, and to ſecure the credit of the ſacred hiſtorian, candour compels us to confeſs that it appears not to be the true ſolution.

The difficulty itſelf ariſes entirely from ſuppoſing the ſun to be the ſole fountain of light; but the truth of this opinion is not ſelf-evident, nor has it ever been eſtabliſhed by ſatisfactory proof. It is indeed to a mind diveſted of undue deference to great names, and conſidering the matter with impartiality, an opinion extremely improbable. The light of a candle placed on an eminence may in a dark night be ſeen in every direction at the diſtance of at leaſt three miles. But if this ſmall body be rendered viſible by means of rays emitted from itſelf, the flame of a candle, which cannot be ſuppoſed more than an inch in diameter, muſt, during every inſtant that it continues to burn, throw from its own ſubſtance luminous matter ſufficient to fill a ſpherical ſpace of ſix miles in diameter. This phenomenon, if real, is certainly ſurpriſing; but if we purſue the reflection a little farther, our wonder will be greatly increaſed. The matter which, when converted into flame, is an inch in diameter, is not, when of the conſiſtence of cotton and tallow, of the dimenſions of the 20th part of an inch; and therefore, on the common hypotheſis, the 20th part of an inch of tallow may be ſo rarefied as to fill a ſpace of 113.0976 cubic miles! a rarefaction which to us appears altogether incredible. We have indeed heard much of the diviſibility of matter *ad infinitum*, and think we underſtand what are uſually called *demonſtrations* of the truth of that propoſition; but theſe demonſtrations prove not the actual diviſibility of real ſolid ſubſtances, but only that on trial we ſhall find no end of the ideal proceſs of dividing and ſubdividing imaginary extenſion.

On the whole, therefore, we are much more inclined to believe that the matter of light is an extremely ſubtile fluid, diffuſed through the corporeal univerſe, and only excited to agency by the ſun and other fiery bodies, than that it conſiſts of ſtreams continually iſſuing from the ſubſtance of theſe bodies. It is indeed an opinion pretty generally received, and certainly not improbable in itſelf, that light and electricity are one and the ſame ſubſtance (ſee *ELECTRICITY-Index*); but we know that the electrical fluid, though pervading the whole of corporeal nature, and, as experiments ſhow, capable of acting with great violence, yet lies dormant and unperceived till its agency be excited by ſome foreign cauſe. Juſt ſo it may be with the matter of light. That ſubſtance may be "diffuſed from one end of the creation * to the other. It may traverſe the whole univerſe, form a communication between the moſt remote ſpheres, penetrate into the inmoſt receſſes of the earth, and only wait to be put in a proper motion to communicate viſible ſenſations to the eye. Light is to the organ of ſight what the air is to the organ of hearing. Air is the medium which, vibrating on the ear, cauſes the ſenſation of ſound; but it equally exiſts round us at all times, though there be no ſonorous body to put it in motion. In like manner, light may be equally extended at all times, by night as well as by day, from the moſt diſtant fixed ſtars to this earth, though it then only ſtrikes our eyes ſo as to excite viſible ſenſations when impelled by the ſun or ſome other maſs of

* *Nature displayed.*

God and his Attributes.

of fire." Nor let any one imagine that this hypothesis interferes with any of the known laws of optics; for if the rays of light be impelled in straight lines, and in the same direction in which they are supposed to be emitted, the phenomena of vision must necessarily be the same.

72 Moses a sound philosopher.

Moses therefore was probably a more accurate philosopher than he is sometimes supposed to be. The element of light was doubtless created, as he informs us, on the first day; but whether it was then put in that state in which it is the medium of vision, we cannot know, and we need not inquire, since there was neither man nor inferior animal with organs fitted to receive its impressions. For the first three days it may have been used only as a powerful instrument to reduce into order the jarring chaos. Or if it was from the beginning capable of communicating visible sensations, and dividing the day from the night, its agency must have been immediately excited by the Divine power till the fourth day, when the sun was formed, and endowed with proper qualities for instrumentally discharging that office. This was indeed miraculous, as being contrary to the present laws of nature: but the whole creation was miraculous; and we surely need not hesitate to admit a less miracle where we are under the necessity of admitting a greater. The power which called light and all other things into existence, could give them their proper motions by ten thousand different means; and to attempt to solve the difficulties of creation by philosophic theories respecting the laws of nature, is to trifle with the common sense of mankind: it is to consider as subservient to a law that very power by whose continued exertion the law is established.

Having thus proved that the universe derives its being, as well as the form and adjustment of its several parts, from the one supreme and self-existent God, let us here pause, and reflect on the sublime conceptions which such astonishing works are fitted to give us of the divine perfections.

73 Infinite power of the Creator.

And, in the first place, how strongly do the works of creation impress on our minds a conviction of the infinite power of their Author? He spoke, and the universe started into being; he commanded, and it stood fast. How mighty is the arm which "stretched out the heavens and laid the foundations of the earth; which removeth the mountains and they know it not; which overturneth them in his anger; which shaketh the earth out of her place, and the pillars thereof tremble! How powerful the word which commandeth the sun, and it riseth not; and which sealeth up the stars;" which sustaineth numberless worlds of amazing bulk suspended in the regions of empty space, and directs their various and inconceivably rapid motions with the utmost regularity! "Lift up your eyes on high, and behold, who hath created all these things? By the word of the Lord were the heavens made, and all the host of them by the breath of his mouth. Hell is naked before him, and destruction hath no covering. He stretcheth out the North over the empty place, and hangeth the earth upon nothing. He has measured the waters in the hollow of his hand, and meted out the heavens with a span; and comprehended the dust of the earth in a measure; and weighed the mountains in scales, and the hills in a balance. Behold! the nations are as a drop of the bucket, and are counted as the small dust of the balance; behold, he taketh up the isles as a very little thing. All nations before him are as nothing, and they are counted to him less than nothing, and vanity. To whom then will ye liken God, or what likeness will ye compare unto him *?"

God and his Attributes.

* Ps. xxxiii. 6, 9; Job ix. 4, &c. xxvi. 6; Isa. xi. 12.

74 His wisdom, † De Nat. Deorum, lib. ii.

As the works of creation are the effects of God's power, they likewise in the most eminent manner display his wisdom. This was so apparent to Cicero, even from the partial knowledge in astronomy which his time afforded, that he declared † those who could assert the contrary void of all understanding. But if that great master of reason had been acquainted with the modern discoveries in astronomy, which exhibit numberless worlds scattered through space, and each of immense magnitude; had he known that the sun is placed in the centre of our system, and that to diversify the seasons the planets move round him with exquisite regularity; could he have conceived that the distinction between light and darkness is produced by the diurnal rotation of the earth on its own axis, instead of that disproportionate whirling of the whole heavens which the ancient astronomers were forced to suppose; had he known of the wonderful motions of the comets, and considered how such eccentric bodies have been preserved from falling upon some of the planets in the same system, and the several systems from falling upon each other; had he taken into the account that there are yet greater things than these, and "that we have seen but a few of God's works;"—that virtuous Pagan would have been ready to exclaim in the words of the Psalmist, "O Lord, how manifold are thy works! In wisdom hast thou made them all; the earth is full of thy riches."

75 And goodness.

That creation is the offspring of unmixed goodness, has been already shown with sufficient evidence (see METAPHYSICS, N° 312. and N° 29. of this article); and from the vast number of creatures on our earth endowed with life and sense, and a capability of happiness, and the infinitely greater number which probably inhabit the planets of this and other systems, we may infer that the goodness of God is as boundless as his power, and that "as is his majesty, so is his mercy." Out of his own fulness hath he brought into being numberless worlds, replenished with myriads of myriads of creatures, furnished with various powers and organs, capacities and instincts; and out of his own fulness he continually and plentifully supplies them all with every thing necessary to make their existence comfortable. "The eyes of all wait upon him, and he giveth them their meat in due season. He openeth his hand and satisfies the desires of every living thing: he loveth righteousness and judgement; the earth is full of the goodness of the Lord. He watereth the ridges thereof abundantly; he settleth the furrows thereof; he maketh it soft with showers, and blesseth the springing thereof. He crowneth the year with his goodness; and his paths drop fatness. They drop upon the pastures of the wilderness; and the little hills rejoice on every side. The pastures are clothed with flocks; the valleys also are covered with corn; they shout with joy, they also sing ‡." Survey the whole of what may be seen on and about this terraqueous globe, and say, if our Maker hath a sparing hand. Surely the Author of so much happiness must be essential goodness; and we must conclude with St John, that "God is love."

‡ Ps. cxlv. 15, 16. xxiii. 5. lv. 10, &c.

These attributes of power, wisdom, and goodness, so conspicuously

God and his Attributes.

conspicuously displayed in the works of creation, belong in the same supreme degree to each person in the blessed Trinity; for Moses declares that the heaven and the earth were created, not by *one* person, but by the *Elohim*. The λογος indeed, or second person, appears to have been the *immediate* Creator; for St John assures us *, that "all things were made by him, and that without him was not any thing made that was made." Some Arian writers of great learning (and we believe the late Dr Price was of the number) have asserted, that a being who was created himself may be endowed by the Omnipotent God with the power of creating other beings; and as they hold the λογος or *word*, to be a creature, they contend that he was employed by the Supreme Deity to create, not the whole universe, but only this earth, or at the utmost the solar system. "The old argument (says one of them), that no being inferior to the great Omnipotent can create a world, is so childish as to deserve no answer. Why may not God communicate the power of making worlds to any being whom he may choose to honour with so glorious a prerogative? I have no doubt but such a power may be communicated to many good men during the progress of their existence; and to say that it may *not*, is not only to limit the power of God, but to contradict acknowledged analogies."

76 The second person in the Trinity the immediate Creator.

* Ch. i. 3.

77 Creation peculiar to God.

We are far from being inclined to limit the power of God. He can certainly do whatever involves not a direct contradiction; and therefore, though we know nothing *analogous* to the power of *creating worlds*, yet as we perceive not any contradiction implied in the notion of that power being communicated, we shall admit that such a communication may be *possible*, though we think it in the highest degree *improbable*. But surely no man will contend that the *whole universe* was brought into existence by *any creature;* because that creature himself, however highly exalted, is necessarily comprehended in the notion of the universe. Now St Paul expressly affirms †, that, by the second person in the blessed Trinity, "were ALL *things* created that are in heaven, and that are in earth, *visible* and *invisible*, whether they be THRONES, or DOMINIONS, or PRINCIPALITIES, or POWERS; all things were created by him and for him; and he is before all things, and by him all things consist." Indeed the Hebrew Scriptures in more places than one ‡ expressly declare that this earth, and of course the whole solar system, was *formed*, as well as *created*, not by an inferior being, but by the *true* God, even *Jehovah* alone; and in the New Testament §, the Gentiles are said to be without excuse for not glorifying him as God, "because his eternal power and Godhead are clearly seen from the creation of the world." But if it were natural to suppose that the power of creating worlds has been, or ever will be, communicated to beings inferior to the great Omnipotent, this reasoning of the apostle's would be founded on false principles, and the sentence which he passed on the Heathen would be contrary to justice.

† Colos. iv. 17.

‡ Isa. xl. 12. xliv. 24. Jerem. x. 10—13.

§ Rom. i. 18—22.

But though it be thus evident that the λογος was the immediate Creator of the universe, we are not to suppose that it was without the concurrence of the other two persons. The Father, who may be said to be the fountain of the Divinity itself, was certainly concerned in the creation of the world, and is therefore in the apostle's creed denominated the "Father Almighty, Maker of heaven and earth;" and that the Holy Ghost or third person is likewise a Creator, we have the express testimony of two inspired writers: "By the word of the Lord (says the Psalmist) were the heavens made, and all the host of them by the breath (Hebrew, SPIRIT) of his mouth." And Job declares, that the "SPIRIT of God made him, and that the breath of the Almighty gave him life." Indeed these three divine persons are so intimately united, that what is done by one must be done by all, as they have but one and the same will. This is the reason assigned by Origen * for our paying divine worship to each; θρησκευομεν ουν τον πατερα της αληθειας και τον υιον την αληθειαν, ονα δυο τη υποστασει πραγματα, εν δε τη ομονοια, και τη συμφωνια και τη ταυτοτητι της βουλησεως, "we worship the Father of truth, and the Son the truth itself, being two things as to hypostasis, but one in agreement, consent, and sameness of will." Nor is their union a mere agreement in will only; it is a physical or essential union: so that what is done by one must necessarily be done by the others also, according to that of our Saviour, "I am in the Father and the Father in me: The Father who dwelleth in me, he doth the works."

* Contr. Cels. p. 386.

SECT. II. *Of the Original State of Man, and the first Covenant of Eternal Life which God vouchsafed to make with him.*

78 Peculiarity of the expression in which God is said to make man.

IN the Mosaic account of the creation, every attentive reader must be struck with the manner in which the supreme Being is represented as making man: "And God said, let US make man in our image, after our likeness; and let *them* have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth. So God created man in his own image; in the image of God created he him; male and female created he THEM. And God blessed them; and God said unto them, be fruitful, and multiply, and replenish the earth, and subdue it; and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth. And God said, behold, I have given you every herb bearing seed, which is upon the face of all the earth; and every tree, in the which is the fruit of a tree yielding seed: to you it shall be for meat. And God saw every thing that he had made, and, behold, it was very good. And the evening and the morning were the sixth day. Thus the heavens and the earth were finished, and all the host of them. And on the seventh day God ended his work which he had made; and he rested on the seventh day from all his works which he had made. And God blessed the seventh day and sanctified it: because that in it he had rested from all his work which God created and made *."

* Gen i. 26, &c. ii. 1, 2, 3.

This is a very remarkable passage, and contains much important information. It indicates a plurality of persons in the Godhead, describes the nature of man as he came at first from the hands of his Creator, and furnishes data from which we may infer what were the duties required of him in that primeval state, and what were the rewards to which obedience would entitle him.

79 In his own image.

Of the plurality of Divine persons, and their essential union, we have treated in the preceding section, and proceed now to inquire into the specific nature of the first man. This must be implied in the *image of God*, in

Original State of Man.

in which he is ſaid to have been created; for it is by that phraſe alone that he is characterized, and his pre-eminence marked over the other animals. Now this image or likeneſs muſt have been found either in his body alone, his ſoul alone, or in both united. That it could not be in his body alone, is obvious; for the infinite and omnipotent God is allowed by all men to be without body, parts, or paſſions, and therefore to be ſuch as nothing corporeal can poſſibly reſemble.

80 Different opinions reſpecting the image of God.

If this likeneſs is to be found in the human ſoul, it comes to be a queſtion in what faculty or power of the ſoul it conſiſts. Some have contended, that man is the only creature on this earth who is animated by a principle eſſentially different from matter; and hence they have inferred, that he is ſaid to have been formed in the Divine image, on account of the immateriality of that vital principle which was infuſed into his body when the "Lord God breathed into his noſtrils the breath of life, and man became a living ſoul †." That this account of the animation of the body of man indicates a ſuperiority of the human ſoul to the vital principle of all other animals, cannot, we think, be queſtioned; but it does not therefore follow, that the human ſoul is the only immaterial principle of life which animates any terreſtrial creature. It has been ſhown elſewhere (ſee METAPHYSICS, N° 235.), that the power of ſenſation, attended with individual conſciouſneſs, as it appears to be in all the higher ſpecies of animals, cannot reſult from any organical ſtructure, or be the quality of a compound extended being. The vital principle in ſuch animals therefore muſt be immaterial as well as the human ſoul; but as the word *immaterial* denotes only a negative notion, the ſouls of men and brutes, though both immaterial, may yet be ſubſtances eſſentially different. This being the caſe, it is plain that the Divine image in which man was formed, and by which he is diſtinguiſhed from the brute creation, cannot conſiſt in the mere circumſtance of his mind being a ſubſtance different from matter, but in ſome poſitive quality which diſtinguiſhes him from every other creature on this globe.

† Gen. ii. 7.

81 Calviniſtic opinions. * *Gill's Body of Divinity*, b. iii. ch. 3.

About this characteriſtic quality various opinions have been formed. Some have ſuppoſed * "that the image of God in Adam appeared in that rectitude, righteouſneſs, and holineſs, in which he was made; for God made man upright (Eccleſ. vii. 2.), a holy and righteous creature; which holineſs and righteouſneſs were in their kind perfect; his underſtanding was free from all error and miſtakes; his will biaſſed to that which is good; his affections flowed in a right channel towards their proper objects; there were no ſinful motions and evil thoughts in his heart, nor any propenſity or inclination to that which is evil; and the whole of his conduct and behaviour was according to the will of God. And this righteouſneſs (ſay they) was *natural*, and not perſonal and acquired. It was not obtained by the exerciſe of his free-will, but was created with him, and belonged to his mind, as a natural faculty or inſtinct." They therefore call it *original righteouſneſs*, and ſuppoſe that it was loſt in the fall.

82 Objected to.

To this doctrine many objections have been made. It has been ſaid that righteouſneſs conſiſting in right actions proceeding from proper principles, could not be created with Adam and make a part of his nature; becauſe nothing which is produced in a man without his knowledge and conſent can be in him either virtue or vice. Adam, it is added, was unqueſtionably placed in a ſtate of trial, which proves that he had righteous habits to *acquire*; whereas the doctrine under conſideration, affirming his original righteouſneſs to have been perfect, and therefore incapable of improvement, is inconſiſtent with a ſtate of trial. That his underſtanding was free from all errors and miſtakes, has been thought a blaſphemous poſition, as it attributes to man one of the incommunicable perfections of the Deity. It is likewiſe believed to be contrary to fact; for either his underſtanding was bewildered in error, or his affections flowed towards an improper object, when he ſuffered himſelf at the perſuaſion of his wife to tranſgreſs the expreſs law of his Creator. The objector expreſſes his wonder at its having ever been ſuppoſed that the *whole* of Adam's conduct and behaviour was according to the will of God, when it is ſo notorious that he yielded to the firſt temptation with which, as far as we know, he was aſſailed in paradiſe.

Convinced by theſe and other arguments, that the image of God in which man was created could not conſiſt in original righteouſneſs, or in exemption from all poſſibility of error, many learned men, and Biſhop Bull * among others, have ſuppoſed, that by the image of God is to be underſtood certain gifts and powers ſupernaturally infuſed by the Holy Spirit into the minds of our firſt parents, to guide them in the ways of piety and virtue. This opinion they reſt chiefly upon the authority of Tatian, Irenæus, Tertullian, Cyprian, Athanaſius, and other fathers of the primitive church; but they think, at the ſame time, that it is countenanced by ſeveral paſſages in the New Teſtament. Thus when St Paul ſays ‡, "and ſo it is written, The firſt man Adam was made a living ſoul, the laſt Adam was made a quickening Spirit;" they underſtand the whole paſſage as relating to the creation of man, and not as drawing a compariſon between Adam and Chriſt, to ſhow the great ſuperiority of the latter over the former. In ſupport of this interpretation they obſerve, that the apoſtle immediately adds, "howbeit, that was not firſt which is ſpiritual, but that which is natural, and afterwards that which is ſpiritual;" an addition which they think was altogether needleſs, if by the quickening Spirit he had referred to the incarnation of Chriſt, which had happened in the very age in which he was writing. They are therefore of opinion, that the body of Adam, after being formed of the duſt of the ground, was firſt animated by a vital principle endowed with the faculties of reaſon and ſenſation, which entitled the whole man to the appellation of a living ſoul. After this they ſuppoſe certain graces of the Holy Spirit to have been infuſed into him, by which he was made a quickening ſpirit, or formed in the image of God; and that it was in conſequence of this ſucceſſion of powers communicated to the ſame perſon, that the apoſtle ſaid, "Howbeit, that was not firſt which is ſpiritual, but that which is natural."

* See his *Engliſh Works*, vol. iii.

83 Opinion of Biſhop Bull and ſome of the ancient fathers

‡ 1 Cor. xv. 45, 46.

We need hardly obſerve, that with reſpect to a queſtion of this kind the authority of *Tatian* and the other fathers quoted is nothing. Thoſe men had no better means of diſcovering the true ſenſe of the ſcriptures of the Old Teſtament than we have; and their ignorance of the language in which theſe ſcriptures are written, added to ſome metaphyſical notions reſpecting the ſoul, which

Original State of Man.

which too many of them had derived from the ſchool of Plato, rendered them very ill qualified to interpret the writings of Moſes. Were authority to be admitted, we ſhould conſider that of Biſhop Bull and his modern followers as of greater weight than the authority of all the ancients to whom they appeal. But authority cannot be admitted; and the reaſoning of this learned and excellent man from the text of St Paul is ſurely very inconcluſive. It makes two perſons of Adam; a firſt, when he was a natural man compoſed of a body and a reaſonable ſoul; a ſecond, when he was endowed with the gifts of the Holy Spirit, and by them formed in the image of God! In the verſe following too, the apoſtle expreſsly calls the ſecond man, of whom he had been ſpeaking, "the Lord from heaven;" but this appellation we apprehend to be too high for Adam in the ſtate of greateſt perfection in which he ever exiſted. That our firſt parents were endowed with the gifts of the Holy Ghoſt, we are ſtrongly inclined to believe for reaſons which ſhall be given by and by; but as theſe gifts were adventitious to their nature, they could not be that image in which God *made* man.

84 ill-founded.

85 Other opinions.

Since man was *made* in the image of God, that phraſe, whatever be its preciſe import, muſt denote ſomething *peculiar* and at the ſame time eſſential to human nature; but the only two qualities at once natural and peculiar to man are his ſhape and his reaſon. As none but an anthropomorphite will ſay that it was Adam's ſhape which reflected this image of his Creator, it has been concluded that it was the faculty of reaſon which made the reſemblance. To give ſtrength to this argument it is obſerved †, that when God ſays, "let us make man in our image," he immediately adds, "and let them have dominion over the fiſh of the ſea, and over the fowl of the air, and over the cattle, and over all the earth;" but as many of the cattle have much greater bodily ſtrength than man, this dominion could not be maintained but by the faculty of reaſon beſtowed upon him and withheld from them.

† *Warburton's Divine Leg.* book ix.

If the image of God was impreſſed only on the mind of man, this reaſoning ſeems to be concluſive; but it has been well obſerved ‡ that it was the whole man, and not the *ſoul alone*, or the *body* alone, that is ſaid to have been formed in the divine image; even as the whole man, ſoul and body, is the ſeat of the new and ſpiritual image of God in regeneration and ſanctification. "The very God of peace (ſays the apoſtle) ſanctify you wholly; and may your whole *ſpirit*, *ſoul* and *body*, be preſerved blameleſs to the coming of our Lord Jeſus Chriſt." It is worthy of notice, too, that the reaſon aſſigned for the prohibition of murder to Noah and his ſons after the deluge, is, that man was made in the image of God. "Whoſo ſheddeth man's blood, by man ſhall his blood be ſhed; for in the image of God made he man." Theſe texts ſeem to indicate, that whatever be meant by the image of God, it was ſtamped equally on the ſoul and on the body. In vain is it ſaid that man cannot reſemble God in ſhape. This is true, but it is little to the purpoſe; for man does not reſemble God in his reaſoning faculty more than in his form. It would be idolatry to ſuppoſe the ſupreme majeſty of heaven and earth to have a body or a ſhape; and it would be little ſhort of idolatry to imagine that he is obliged to compare ideas and notions together; to advance from particular truths to general propoſitions; and to acquire knowledge, as we do, by the tedious proceſſes of inductive and ſyllogiſtic reaſoning. There can therefore be no direct image of God either in the ſoul or in the body of man; and the phraſe really ſeems to import nothing more than thoſe powers or qualities by which man was fitted to exerciſe dominion over the inferior creation; as if it had been ſaid, "Let us make man in our image, after our likeneſs, that *they may have* dominion, &c." But the erect form of man contributes in ſome degree, as well as his rational powers, to enable him to maintain his authority over the brute creation; for it has been obſerved by travellers, that the fierceſt beaſt of prey, unleſs ready to periſh by hunger, ſhrinks back from a ſteady look of the human face divine.

‡ *Gill's Body of Divinity*, book iii. chap. 3.

Original State of Man.

86 True import of the phraſe.

By ſome *, however, who have admitted the probability of this interpretation, another has been deviſed for its being ſaid that man was formed in the image of God. All the members of Chriſt's body, ſay they, were written and delineated in the book of God's purpoſes and decrees, and had an ideal exiſtence from eternity in the divine mind; and therefore the body of Adam might be ſaid to be formed after the image of God, becauſe it was made according to that idea. But to this reaſoning objections may be urged, which we know not how to anſwer. All things that ever were or ever ſhall be, the bodies of us who live at preſent as well as the bodies of thoſe who lived 5000 years ago, have from eternity had an ideal exiſtence in the Divine mind; nor in this ſenſe can one be ſaid to be prior to another. It could not therefore be after the idea of the identical body of Chriſt that the body of Adam was formed; for in the Divine mind ideas of both bodies were preſent together from eternity, and each body was formed after the ideal archetype of itſelf. It may be added likewiſe, that the body of Chriſt was not God, nor the idea of that body the idea of God. Adam therefore could not with propriety be ſaid to have been formed in the image of God, if by that phraſe nothing more were intended than the reſemblance between his body and the body of Chriſt. Theſe objections to this interpretation appear to us unanſwerable; but we mean not to dictate to our readers. Every man will adopt that opinion which he thinks ſupported by the beſt arguments; but it is obvious, that whatever more may be meant by the image of God in which man was made, the phraſe undoubtedly comprehends all thoſe powers and qualities by which he is enabled to maintain his authority over the inferior creation. Among theſe the faculty of reaſon is confeſſedly the moſt important; for it is by it that man is capable of being made acquainted with the Author of his being, the relation which ſubſiſts between them, and the duties implied in that relation from the creature to the Creator.

* *Gill*, &c.

87 Religious instruction communicated to Adam.

That the firſt man, however, was not left to diſcover theſe things by the mere efforts of his own unaſſiſted reaſon, we have endeavoured to ſhow in another place; (ſee RELIGION, N° 5—10.); and the concluſion to which we were there led, is confirmed by the portion of revelation before us. The inſpired hiſtorian ſays, that "God bleſſed the ſeventh day and *ſanctified* it, becauſe that in it he had reſted from all his works, which he created and made;" but Adam could not have underſtood what was meant by the *ſanctification* of a particular day, or of any thing elſe, unleſs he had previouſly received

Original State of Man.

received ſome religious inſtruction. There cannot therefore be a doubt, but that as ſoon as man was made, his Creator communicated to him the truths of what is called natural religion, which we have endeavoured to explain and eſtabliſh in Part I. of this article; and to theſe were added the precept to keep holy the Sabbath-day, and ſet it apart for the purpoſes of contemplation and worſhip.

88 Inſtitution of the Sabbath.

This was a very wiſe inſtitution, as all the divine inſtitutions muſt be. "The great end for which we are brought into life, is to attain the knowledge and be confirmed in the love of God. This includes obedience to his will in thought, word, and deed, or that courſe of conduct which can alone make us happy here, and fit us for everlaſting glory hereafter. But of theſe things we cannot retain a proper ſenſe without cloſe and repeated application of thought; and the unavoidable cares and concerns of the preſent life occupying much of our attention, it is, in the nature of things, neceſſary that ſome certain portion of time ſhould be appropriated to the purpoſes of religious inſtruction and the public adoration of our Creator, in whom we all live, and move, and have our being." Hence a very learned divine † has inferred, that though the particular time is a matter of poſitive appointment, the obſervation of a ſabbath in general is a duty of natural religion, as having its foundation in the reaſon of things. See SABBATH.

† *Dr Taylor of Norwich.*

89 Duties of man in his original ſtate,

Man therefore in his *natural* and original ſtate was a rational and religious being, bound to do "juſtice, to love mercy, to walk humbly with his God, and to keep holy the Sabbath-day." Theſe ſeem to be all the duties which in that ſtate were required of him; for as ſoon as he was introduced into the terreſtrial paradiſe and admitted into covenant with his Maker, he was placed in a *ſupernatural* ſtate, when other duties were of courſe enjoined.

‡ Gen. i. 27. v. 2.

That our firſt parents were both made on the ſixth day, Moſes expreſsly affirms when he ſays ‡, that "God created them male and female, and bleſſed them, and called *their* name *Adam* (K), in the day when they were created:" but that they were introduced into the garden of Eden on that day, is an opinion which, however generally it may be received, ſeems not to be reconcileable with the plain narrative of the ſacred penman. After telling us that on the ſixth day God finiſhed all his works, which he ſaw to be very good, and reſted on the ſeventh day, he briefly recapitulates the hiſtory of the generations of the heavens and of the earth, gives us a more particular account of the formation of the firſt man, informing us that the "Lord God formed him out of the duſt of the ground, and breathed into his noſtrils the breath of life, when man became a living ſoul;" and then proceeds to ſay ‖, that the "Lord God planted a garden eaſtward in Eden, where he put the man whom he HAD *formed*." From this ſhort hiſtory of the firſt pair it appears beyond diſpute evident, that neither the man nor the woman was formed *in* the garden; and that from their creation ſome time elapſed before the garden was prepared for their reception, is likewiſe evident from a compariſon of Gen. i. 29. with Gen. ii. 16, 17. In the firſt of theſe paſſages God gives to man, immediately after his creation, "every herb bearing ſeed which was upon the face of all the earth, and *every tree*, without exception, in which was the fruit of a tree bearing ſeed: to him he ſaid it ſhould be for meat." In the ſecond, "he commanded the man, ſaying, of every tree of the garden thou mayeſt freely eat; but of the tree of knowledge of good and evil, thou ſhalt not eat of it; for in the day thou eateſt thereof thou ſhalt ſurely die." When the firſt grant of food was given, Adam and his wife muſt have been where no tree of knowledge grew, and they muſt have been intended to live at leaſt ſo long in that ſtate as that they ſhould have occaſion for food, otherwiſe the formal grant of it would have been not only ſuperfluous, but apt to miſlead them with reſpect to the ſubſequent reſtriction.

‖ Gen. ii. 7, 8, and 15.

Original State of Man.

90 before he was placed in the garden of Eden,

In this original ſtate man was under the diſcipline of what we have called *natural religion*, entitled to happineſs while he ſhould perform the duties required of him, and liable to puniſhment when he ſhould neglect thoſe duties, or tranſgreſs the law of his nature as a rational and moral agent. This being the caſe, it is a matter of ſome importance, to aſcertain, if we can, what the rewards and puniſhments are which natural religion holds out to her votaries.

That under every diſpenſation of religion the pious and virtuous man ſhall enjoy more happineſs than miſery; and that the incorrigibly wicked ſhall have a greater portion of miſery than happineſs, are truths which cannot be controverted by any one who admits, that the Almighty governor of the univerſe is a Being of wiſdom, goodneſs, and juſtice. But reſpecting the rewards of virtue and the puniſhment of vice, more than theſe general truths ſeems not to be taught by natural religion. Many divines, however, of great learning and worth, have thought otherwiſe, and have contended, that from the nature of things the rewards beſtowed by an infinite God upon piety and virtue muſt be eternal like their author. Theſe men indeed appear willing enough to allow that the puniſhments with which natural religion is armed againſt vice muſt be only of a temporary duration, becauſe reaſon, ſay they, is ready to revolt at the thought of *everlaſting* puniſhment.

91 did not, when performed, entitle him to eternal life.

This opinion, which confounds natural with revealed religion, giving to the former an important truth which belongs excluſively to the latter, has been ſo ably confuted by a learned writer, that we ſhall ſubmit his arguments to our readers in preference to any thing which we can give ourſelves.

"If reaſon doth, on the one hand, ſeem to revolt at *everlaſting puniſhment*, we muſt confeſs that FANCY, on the other, (even when full plumed by *vanity*), hath ſcarcely force enough to riſe to the idea of *infinite rewards*. How the heart of man came to conſider this as no more than an adequate retribution for his right conduct during the ſhort trial of his virtue here, would be

(K) The woman was ſome time afterwards diſtinguiſhed by the name of Eve, חוה, becauſe ſhe was to be the mother all living, and particularly of that bleſſed ſeed which was to bruiſe the head of the ſerpent. See *Parkhurſt's Lexicon* on the word.

Original State of Man.

be hard to tell, did we not know what monsters PRIDE begot of old upon *Pagan philosophy;* and how much greater still these latter ages have disclosed, *by the long* incubation of *school-divinity* upon *folly*. What hath been urged from natural reason, in support of this extravagant presumption, is so very slender, that it recoils as you enforce it. First, you say, "that the soul, the subject of these eternal rewards, being *immaterial*, and so therefore unaffected by the causes which bring material things to an end, is, by its nature, fitted for eternal rewards.—This is an argument *ad ignorantiam*, and holds no farther.—Because an *immaterial* being is not subject to that mode of dissolution which affects *material* substances, you conclude it to be eternal. This is going too fast. There may be, and probably are, many natural causes (unknown indeed to us), whereby immaterial beings come to an end. But if the nature of things cannot, yet God certainly can, put a final period to such a being when it hath served the purpose of its creation. Doth ANNIHILATION impeach that wisdom and goodness which was displayed when God brought it *out of nothing?* Other immaterial beings there are, viz. the souls of brutes, which have the same natural security with man for their existence, of whose *eternity* we never dream. But pride, as the poet observes, *calls God unjust*,

92 Arguments to prove that they did inconclusive.

> If man alone engross not heaven's high care;
> Alone made *perfect* here, IMMORTAL there.

However, let us (for argument's sake) allow the human soul to be unperishable by nature, and secured in its existence by the unchangeable will of God, and see what will follow from thence—An *infinite* reward for virtue during one moment of its existence, because reason discovers that, by the law of nature, *some* reward is due? By no means. When God hath amply repaid us for the performance of our duty, will he be at a loss how to dispose of us for the long remainder of *eternity?* May he not find new and endless employment for reasonable creatures, to which, when properly discharged, new rewards and in endless succession will be assigned? Modest reason seems to dictate this to the followers of the *law of nature*. The flattering expedient of ETERNAL REWARDS for virtue here was invented in the simplicity of early speculation, after it had fairly brought men to conclude that the soul is immaterial.

"Another argument urged for the eternity of the rewards held out by natural religion to the practice of piety and virtue is partly physical and partly moral. The merit of service (say the admirers of that religion) increases in proportion to the excellence of that Being to whom our service is directed and becomes acceptable. An infinite being, therefore, can dispense no rewards but what are infinite. And thus the virtuous man becomes entitled to immortality.

"The misfortune is, that this reasoning holds equally on the side of the unmerciful doctors, as they are called, who doom the wicked to EVERLASTING PUNISHMENT. Indeed were this the only discredit under which it labours, the mercileſs doctors would hold themselves little concerned. But the truth is, that the argument from *infinity* proves just nothing. To make it of any force, both the parties should be *infinite*. This inferior emanation of God's *image*, MAN, should either be supremely good or supremely bad, a kind of deity or a kind of devil. But these reasoners, in their attention to the *divinity*, overlook the *humanity*, which makes the decrease keep pace with the accumulation, till the rule of logic, that the *conclusion follows the weaker* part, comes in to end the dispute *."

Original State of Man.

These arguments seem to prove unanswerably that immortality is not essential to any part of the compound being man, and that it cannot be claimed as a reward due to his virtue. It is not indeed essential to any created being, for what has not existence of itself, cannot of itself have perpetuity of existence (see METAPHYSICS, N° 272, &c.); and as neither man nor angel can be profitable to God, they cannot claim from him any thing as a debt. Both, indeed, as moral agents, have duties prescribed them; and while they faithfully perform these duties, they have all the security which can arise from the perfect benevolence of him who brought them into existence, that they shall enjoy a sufficient portion of happiness to make that existence preferable to non-existence; but reason and philosophy furnish no data from which it can be inferred that they shall exist for ever. Man is composed in part of perishable materials. However perfect Adam may be thought to have been when he came first from the hands of his Creator, his body, as formed of the dust of the ground, must have been naturally liable to decay and dissolution. His soul, indeed, was of a more durable substance; but as it was formed to animate his body, and had no prior conscious existence, it is not easy to conceive what should have led him, under an equal providence, where rewards and punishments were exactly distributed, to suppose that one part of him should survive the other. In his natural and original state, before the covenant made with him in paradise, he was unquestionably a mortal creature. How long he continued in that state, it seems not possible to form a plausible conjecture. Bishop Warburton supposes him to have lived several years under no other dispensation than that of natural religion; during which he was as liable to death as his fallen posterity are at present.

* *Warburton's Divine Legation*, book ix.

93 Adam before his introduction into paradise liable to death.

"We must needs conclude (says this learned writer*), that God having tried Adam in *the state of nature*, and approved of the good use he made of his free-will under the direction of that light, advanced him to a superior station in *Paradise*. How long, before this remove, man had continued subject to *natural religion* alone, we can only guess: but of this we may be assured, that it was some considerable time before the garden of Eden could naturally be made fit for his reception. Since Moses, when he had concluded his history of the creation, and of God's *rest* on, and *sanctification* of, the seventh day proceeds to speak of the condition of this new world in the following terms: "*And God made every plant of the field before it was in the earth, and every herb of the field before it grew; for the Lord God had not caused it to rain upon the earth*†." Which seems plainly to intimate, that when the seeds of vegetables had been created on the third day, they were left to nature, in its ordinary operations, to mature by sun and showers. So that when in course of time Paradise was become capable of accommodating its inhabitants, they were transplanted thither."

* *Divine Legation*, book ix. chap. i.

94 How long he continued in that state,

† Gen. ii. 4, 5.

This reasoning is not without a portion of that ingenuity which was apparent in every thing that fell from the pen of Warburton; but it was completely confuted

Original State of Man.

ed almost as soon as it was given to the public, and shown to be deduced from premises which could be employed against the author's system. If only the *seeds* of vegetables were created on the third day, and then left to nature, in its ordinary operations, to mature by sun and showers, the first pair must have perished before a single vegetable could be fit to furnish them with food; and we may suppose that it was to prevent this disaster that the garden of Eden was miraculously stored at once with full grown trees and fruit in perfect maturity, whilst the rest of the earth was left under the ordinary laws of vegetation. There is, however, no evidence that they were only the *seeds* of vegetables that God created. On the contrary, Moses says expresly †, that God made the earth on the third day bring forth the herb *yielding* seed after his kind, and the tree *yielding fruit* whose *seed* was in itself after his kind;" and when he recapitulates the history of the creation, he says, that God made, not every seed, but every *plant* of the field *before* it was in the earth, and every *herb* of the field *before* it grew. From the process of vegetation, therefore, nothing can be inferred with respect to the time of Adam's introduction into Paradise, or to ascertain the duration of his original state of nature. If angels were created during the six days of which the Hebrew lawgiver writes the history, an hypothesis very generally received (see ANGEL), though in the opinion of the present writer not very probable, there can be no doubt but our first parents lived a considerable time under the law of nature before they were raised to a superior station in the garden of Eden; for it seems very evident that the period of their continuance *in* that station was not long. Of this, however, nothing can be said with certainty. They may have lived for years or only a few days in their original state; but it is very necessary to distinguish between that state in which they were under no other dispensation than what is commonly called *natural religion*, entitled, upon their obedience, to the indefinite rewards of piety and virtue, and their state in Paradise when they were put under a new law, and by the free grace of God promised, if they should be obedient, a supernatural and eternal reward. Into that state we must now attend them, and ascertain, if we can, the precise terms of the first covenant.

† Gen. i. 12.

95 impossible to be known.

Moses, who in this investigation is our only guide, tells us, that the Lord God, after he had formed the first pair, "planted a garden eastward in Eden, and took the man and put him into the garden to dress it and to keep it. And the Lord God (continues he) commanded the man, saying, of every tree of the garden thou mayest freely eat; but of the tree of the knowledge of good and evil thou shalt not eat of it; for in the day that thou eatest thereof, thou shalt surely die ‡." Here is no mention made of the laws of piety and moral virture resulting from the relation in which the various individuals of the human race stand to each other, and in which all as creatures stand to God their Almighty and beneficent Creator. With these laws Adam was already well acquainted; and he must have been sensible, that as they were founded in his nature no subsequent law could dispense with their obligation. They have been equally binding on all men in every state and under every dispensation; and they will continue to be so as long as the general practice of justice, mercy, and piety, shall contribute to the sum of human happiness. The new law peculiar to his paradisaical state was the command not to eat of the fruit of the tree of the knowledge of good and evil. This was a positive precept, not founded in the nature of man, but very proper to be the test of his obedience to the will of his Creator. The laws of piety and virtue are sanctioned by nature, or by that general system of rules according to which God governs the physical and moral worlds, and by which he has secured, in some state or other, happiness to the pious and virtuous man, and misery to such as shall prove incorrigibly wicked. The law respecting the forbidden fruit was sanctioned by the penalty of *death* denounced against disobedience; and by the subjects of that law the nature of this penalty must have been perfectly understood: but Christian divines, as we shall afterwards see, have differed widely in opinion respecting the full import of the Hebrew words which our translators have rendered by the phrase *thou shalt surely die*. All, however, agree that they threatened death, in the common acceptation of the word, or the separation of the soul and body as one part of the punishment to be incurred by eating the forbidden fruit; and hence we must infer, that had the forbidden fruit not been eaten, our first parents would never have died, because the penalty of death was denounced against no other transgression. What therefore is said respecting the fruit of the tree of knowledge, implies not only a law but also a covenant (L), promising to man, upon the observance of one positive precept, immortality or eternal life; which is not essential to the nature of any created being, and cannot be claimed as the merited reward of the greatest virtue or the most fervent piety.

Original State of Man.

‡ Gen. ii. 8, 15, 16, 17.

96 The covenant of eternal life made with Adam in paradise,

This obvious truth will enable us to dispose of the objections which have been sometimes brought by freethinking divines against the wisdom and justice of punishing so severely as by death the breach of a mere positive precept; which, considered in itself, appears to be a precept of very little importance. We have only to reply, that as an exemption from death is not due either

(L) It does not appear that any transaction between God and mankind in general was denominated by a word equivalent to the English word *covenant* till the end of the fourth century, when such phraseology was introduced into the church by the celebrated Augustine, bishop of Hippo. That the phraseology is strictly proper, no man can suppose who reflects on the infinite distance between the contracting parties, and the absolute dominion of the one over the other. To be capable of entering into a *covenant*, in the proper sense of the word, both parties must have a right either to agree to the terms proposed or to reject them; but surely Adam had no right to bargain with his Maker, or to refuse the gift of immortality on the terms on which it was offered to him. The word *dispensation* would more accurately denote what is here meant by the word *covenant*; but as this last is in general use, we have retained it as sufficient, when thus explained, to distinguish what man received from God upon certain positive conditions, from what he had a claim to by the constitution of his nature.

Original State of Man.

either to the nature or to the virtue of man, it was wise and just to make it depend on the observance of a positive precept, to impress on the minds of our first parents a constant conviction that they were to be preserved immortal, not in the ordinary course of divine providence, but by the special grace and favour of God. The same consideration will show us the folly of those men who are for turning all that is said of the trees of knowledge and of life into figure and allegory. But the other trees which Adam and Eve were permitted to eat were certainly real trees, or they must have perished for want of food. And what rules of interpretation will authorise us to interpret *eating* and *trees* literally in one part of the sentence and figuratively in the other? A garden in a delightful climate is the very habitation, and the fruits produced in that garden the very food, which we should naturally suppose to have been prepared for the progenitors of the human race; and though in the garden actually fitted up for this purpose two trees were remarkably distinguished from the rest, perhaps in situation and appearance as well as in use, the distinction was calculated to serve the best of purposes. The one called the *tree of life*, of which, while they continued innocent, they were permitted to eat, served as a sacramental pledge or assurance on the part of God, that as long as they should observe the terms of the covenant their life should be preserved; the other, of which it was death to taste, was admirably adapted to impress on their minds the necessity of implicit obedience to the Divine will, in whatever manner it might be made known to them.

A question has been started of some importance, What would have finally become of men if the first covenant had not been violated? That they would have been all immortal is certain; but it is by no means clear that they would have lived for ever on this earth. On the contrary, it has been an article of very general belief in all ages of the church †, that the garden of Eden was an emblem or type of heaven, and therefore called *Paradise* (see PARADISE); and that under the first covenant, mankind, after a sufficient probation here, were to be translated into heaven without tasting death. This doctrine is not indeed explicitly taught in Scripture; but many things conspire to make it highly probable. The frequent communications between God and man before the fall (M), seem to indicate that Adam was training up for some higher state than the terrestrial paradise. Had he been intended for nothing but to cultivate the ground and propagate his species, he might have been left like other animals to the guidance of his own reason and instincts; which, after the rudiments of knowledge were communicated to him, must surely have been sufficient to direct him to every thing necessary to the comforts of a life merely sensual and rational, otherwise he would have been an imperfect animal. It is obvious too, that this earth, however fertile it may have originally been, could not have afforded the means of subsistence to a race of immortal beings multiplying to infinity. For these reasons, and others which will readily occur to the reader, it seems incontrovertible, that, under the first covenant, either mankind would have been successively translated to some superior state, or would have ceased to propagate their kind as soon as the earth should have been replenished with inhabitants. He who reflects on the promise, that, after the general resurrection, there is to be a new heaven and a new earth, will probably embrace the latter part of the alternative; but that part in its consequences differs not from the former. In the new earth promised in the Christian revelation, nothing is to dwell but righteousness. It will therefore be precisely the same with what we conceive to be expressed by the word heaven; and if under the first covenant this earth was to be converted into a similar place, where, after a certain period, men should neither marry nor be given in marriage, but enjoy what divines have called the *beatific vision*, we may confidently affirm, that, had the first covenant been faithfully observed, Adam and his posterity, after a sufficient probation, would all have been translated to some superior state or heaven.

† *Bull's State of Man before the fall.*

97 had it not been violated, entitled him to heaven,

98 and the gifts of divine grace.

To fit them for that state, the gifts of divine grace seem to have been absolutely necessary. To them it was a state certainly supernatural, otherwise a God of infinite wisdom and perfect goodness would not, for a moment, have placed them in an inferior state. But to enable any creature, especially such a creature as man, whom an ancient philosopher has justly styled ζωον μιμητικον, to rise above its *nature*, foreign and divine aid is unquestionably requisite: and therefore, though we cannot persuade ourselves that the gifts of the Holy Ghost constituted that image of God in which man was originally made, we agree with Bishop Bull, that these gifts were bestowed on our first parents to enable them to fulfil the terms of the covenant under which they were placed.

On the whole, we think it apparent from the portions of scripture which we have examined, that Adam and Eve were endued with such powers of body and mind as fitted them to exercise dominion over the other animals; that those powers constituted that image of God in which they are said to have been formed; that they received by immediate revelation the first principles of all useful knowledge, and especially of that system which is usually called *natural religion;* that they lived for some time with no other religion, entitled to the natural rewards of piety and virtue, but all the while liable to death; that they were afterwards translated into paradise, where they were placed under a new law, with the penalty of death threatened to the breach of it, and the promise of endless life if they should faithfully observe it; and that they were endued with the gifts of the Holy Ghost, to enable them, if not wanting to themselves, to fulfil the terms of that covenant, which has been improperly termed the *covenant of works*, since it flowed from the mere grace of God, and conferred privileges on man to which the most perfect human virtue could lay no just claim.

99 It is therefore improperly called the *covenant of works*,

SECT. III. *Of the Fall of Adam, and its Consequences.*

FROM the preceding account of the primeval state of man,

(M) That there were such frequent communications, has been shown to be in the highest degree probable by the late Dr Law bishop of Carlisle. See his *Discourse on the several Dispensations of revealed Religion.*

Fall of Adam, and its consequences.

100 as it could be violated only by disobedience to one positive command.

man, it is evident that his continuance in the terrestrial paradise, together with all the privileges which he there enjoyed, were made to depend on his observance of one positive precept. Every other duty incumbent on him, whether as resulting from what is called the law of his nature, or from the express command of his God, was as much his duty before as after he was introduced into the garden of Eden; and though the transgression of any law would undoubtedly have been punished, or have been forgiven only in consequence of sincere repentance and amendment, it does not appear that a breach of the *moral* law, or of the commandment respecting the sanctification of the *Sabbath-day*, would have been punished with death, whatever may be the import of that word in the place where it is first threatened. The punishment was denounced only against eating the fruit of the tree of the knowledge of good and evil: "For "the Lord God commanded the man, saying, of every tree of the garden thou mayest freely eat, but of the tree of the knowledge of good and evil thou shalt not eat of it; for in the day that thou eatest thereof thou shalt surely die." To the word *death* in this passage divines have affixed many and different meanings. By some it is supposed to import a separation of the soul and body, while the latter was to continue in a state of conscious existence; by others, it is taken to imply annihilation or a state without consciousness; by some, it is imagined to signify eternal life in torments; and by others a spiritual and moral death, or a state necessarily subject to sin. In any one of these acceptations it denoted something new to Adam, which he could not understand without an explanation of the term; and therefore, as it was threatened as the punishment of only one transgression, it could not be the divine intention to inflict it on any other.

101 It was violated,

The abstaining from a particular fruit in the midst of a garden abounding with fruits of all kinds, was a precept which at first view appears of easy observation; and the penalty threatened against the breach of it was, in every sense, awful. The precept, however, was broken notwithstanding that penalty; and though we may thence infer that our first parents were not beings of such absolute perfection as by divines they have sometimes been represented, we shall yet find, upon due consideration, that the temptation by which they were seduced, when taken with all its circumstances, was such as no wise and modest man will think himself able to have resisted. The short history of this important transaction, as we have it in the third chapter of the book of Genesis, is as follows.

"Now the serpent was more subtile than any beast of the field which the Lord God had made; and he said unto the woman, Yea, hath God said, ye shall not eat of every tree of the garden? And the woman said unto the serpent, We may eat of the fruit of the trees of the garden; but of the fruit of the tree which is in the midst of the garden, God hath said ye shall not eat of it, neither shall ye touch it, lest ye die. And the serpent said unto the woman, ye shall not surely die: For God doth know, that on the day ye eat thereof, then your eyes shall be opened, and ye shall be as gods, knowing good and evil. And when the woman *saw* that the tree was good for food, and that it was pleasant to the eyes, and a tree to be desired to make one wise, she took of the fruit thereof, and did eat, and gave also unto her husband with her, and he did eat."

Fall of Adam, and its consequences.

102 in consequence of a most artful temptation,

To the less attentive reader this conversation between the serpent and the woman must appear to begin abruptly; and indeed it is not possible to reconcile it with the natural order of a dialogue, or even with the common rules of grammar, but by supposing the tempter's question, "Yea, hath God said, ye shall not eat of every tree of the garden?" to have been suggested by something immediately preceding either in words or in significant signs. Eve had undoubtedly by some means or other informed the serpent that she was forbidden to eat of the fruit on which he was probably feasting; and that information, whether given in words or in actions, must have produced the question with which the sacred historian begins his relation of this fatal dialogue. We are told that the woman *saw* that the tree was *good for food;* that it was pleasant to the eyes, and a tree to be *desired to make one wise;* but all this she could not have *seen*, had not the serpent eaten of its fruit in her presence. In her walks through the garden, it might have often appeared pleasant to her eyes; but previous to experience she could not know but that its fruit was the most deadly poison, far less could she conceive it capable of conferring wisdom. But if the serpent ate of it before her, and then extolled its virtues in rapturous and intelligible language, she would at once see that it was not destructive of animal life, and naturally infer that it had very singular qualities. At the moment she was drawing this inference, it is probable that he invited her to partake of the delicious fruit, and that her refusal produced the conference before us. That she yielded to his temptation need excite no wonder; for she knew that the serpent was by nature a mute animal, and if he attributed his speech to the virtues of the tree, she might infer, with some plausibility, that what had power to raise the brute mind to human, might raise the human to divine, and make her and her husband, according to the promise of the tempter, become as gods, knowing good and evil. Milton, who was an eminent divine as well as the prince of poets, makes her reason thus with herself.

> Great are thy virtues, doubtless, best of fruits,
> Tho' kept from man, and worthy to be admir'd;
> Whose taste, too long forborne, at first essay
> Gave elocution to the mute, and taught
> The tongue not made for speech to speak thy praise.
> * * * * *
> ———For us alone
> Was death invented? or to us denied
> This intellectual food, for beasts reserved?
> For beasts it seems: yet that one beast which first
> Hath tasted, envies not, but brings with joy
> The good befallen him, author unsuspect,
> Friendly to man, far from deceit or guile.
> What fear I then, rather what know to fear
> Under this ignorance of good and evil,
> Of God or death, of law or penalty?
> Here grows the cure of all, this fruit divine,
> Fair to the eye, inviting to the taste,
> Of virtue to make wise: what hinders then
> To reach, and feed at once both body and mind?
> *Paradise Lost*, book ix.

Full

Fall of Adam, and its consequences.

Full of these hopes of raising herself to divinity, and not, as has sometimes been supposed, led headlong by a sensual appetite, she took of the fruit and did eat, and gave to her husband with her, and he did eat. The great poet makes Adam delude himself with the same sophistry that had deluded Eve, and infer, that as the serpent had attained the language and reasoning powers of man, they should attain

> Proportional ascent, which could not be
> But to be gods, or angels, demi-gods.

103 and Adam and Eve turned out of paradise.

Thus was the covenant, which, on the introduction of our first parents into paradise, their Creator was graciously pleased to make with them, broken by their violation of the condition on which they were advanced to that supernatural state; and therefore the historian tells us, that "lest they should put forth their hand and take also of the tree of life and eat, and live for ever, the Lord God sent them forth from the garden of Eden to till the ground from whence they were taken (N)." Had they been so sent forth without any farther intimation respecting their present condition or their future prospects, and if the death under which they had fallen was only a loss of consciousness, they would have been in precisely the same state in which they lived before they were placed in the garden of Eden; only their minds must now have been burdened with the inward sense of guilt, and they must have *known* themselves to be subject to death; of which, though not exempted from it by nature, they had probably no *apprehension* till it was revealed to them in the covenant of life which they had so wantonly broken.

God, however, did not send them forth thus hopeless and forlorn from the paradise of delights which they had so recently forfeited. He determined to punish them for their transgression, and at the same time to give them an opportunity of recovering more than their lost inheritance. Calling therefore the various offenders before him, and inquiring into their different degrees of guilt, he began with pronouncing judgment on the serpent in terms which implied that there was mercy for man. "And the Lord God said unto the serpent, Because thou hast done this, thou art cursed above all cattle, and above every beast of the field: upon thy belly shalt thou go, and dust shalt thou eat all the days of thy life; and I will put enmity between thee and the woman, and between thy seed and her seed: it shall bruise thy head, and thou shalt bruise his heel."

104 The tempter punished.

That this sentence has been fully inflicted on the serpent, no reasoning can be necessary to evince. Every species of that reptile is more hateful to man than any other terrestrial creature; and there is literally a perpetual war between them and the human race. It is remarkable too that the *head* of this animal is the only part which it is safe to bruise. His tail may be bruised, or even cut off, and he will turn with fury and death on his adversary: but the slightest stroke on the head infallibly kills him. That the serpent, or at least the greater part of serpents, go on their belly, every one knows; though it is said †, that in some parts of the east serpents have been seen with wings, and others with feet, and that these species are highly beautiful. If there be any truth in this story, we may suppose that these walking and flying serpents have been suffered to retain their original elegance, that mankind might see what the whole race was before the curse was denounced on the tempter of Eve: but it is certain that most of the species have neither wings nor feet, and that many of the most poisonous of them live in burning deserts, where they have nothing to eat but the dust among which they crawl ‡.

Fall of Adam, and its consequences.

† *Delanay's Rev. examined with candour.*

‡ See *Bochart and Pliny on Serpents, with Bruce's Travels.*

To this degradation of the serpent, infidels have objected, that it implies the punishment of an animal which was incapable of guilt; but this objection is founded in thoughtlessness and ignorance. The elegant form of any species of inferior animals adds nothing to the happiness of the animals themselves: the ass is probably as happy as the horse, and the serpent that crawls as he that flies. Fine proportions attract indeed the notice of man, and tend to impress upon his mind just notions of the wisdom and goodness of the Creator; but surely the symmetry of the horse or the beauty of the peacock is more properly displayed for this purpose than the elegance of the instrument employed by the enemy of mankind. The degradation of the serpent in the presence of our first parents must have served the best of purposes. If they had so little reflection as not yet to have discovered that he was only the instrument with which a more powerful being had wrought their ruin, they would be convinced, by the execution of this sentence, that the forbidden fruit had no power in itself to improve the nature either of man or of beast. But it is impossible that they could be so stupid as this objection supposes them. They doubtless knew by this time that some great and wicked spirit had actuated the organs of the serpent; and that when enmity was promised to be put between its seed and the seed of the woman, that promise was not meant to be fulfilled by serpents occasionally biting the heels of men, and by men in return bruising the heads of serpents! If such enmity, though it has literally taken place, was all that was meant by this prediction, why was not Adam directed to bruise the head of the identical serpent which had seduced his wife? If he could derive any consolation from the exercise of revenge, surely it would be greater from his revenging himself on his own enemy, than from the knowledge that there should be a perpetual warfare between his descendants and the breed of serpents through all generations.

We are told, that when the foundations of the earth were laid, the morning stars sang together, and all the sons of God shouted for joy; and it is at least probable that there would be similar rejoicing when the six days work of creation was finished. If so, Adam and Eve, who were but a little lower than the angels, might be admitted into the chorus, and thus be made acquainted with the existence of good and evil spirits. At all events, we cannot doubt but their gracious and merciful Creator

(N) The ideas which this language conveys are indeed *allegorical*; but they inform us of this, and nothing but this, that *immortal life was a thing extraneous to our nature*, and not put into our paste or composition when first fashioned by the forming hand of the Creator." *Warburton's Divine Legation*, book ix. chap. 1.

Fall of Adam, and its consequences.

Creator would inform them that they had a powerful enemy; that he was a rebellious angel capable of deceiving them in many ways; and that they ought therefore to be constantly on their guard against his wiles. They must have known too that they were themselves animated by something different from matter; and when they found they were deceived by the serpent, they might surely, without any remarkable stretch of sagacity, infer that their malignant enemy had actuated the organs of that creature in a manner somewhat similar to that in which their own souls actuated their own bodies. If this be admitted, the degradation of the serpent would convince them of the weakness of the tempter when compared with their Creator; and confirm their hopes, that since he was not able to preserve unhurt his own instrument of mischief, he should not be able finally to prevail against them; but that though he had bruised their heels, the promised seed of the woman should at last bruise his head, and recover the inheritance which they had lost. See PROPHECY, N° 9, 10.

105 Sentence passed on Adam and Eve.

Having thus punished the original instigator to evil, the Almighty Judge turned to the fallen pair, and said to the woman, "I will greatly multiply thy sorrow and thy conception: in sorrow shalt thou bring forth children; and thy desire shall be to thy husband, and he shall rule over thee. And unto Adam he said, Because thou hast hearkened unto the voice of thy wife, and hast eaten of the tree of which I commanded thee, saying, Thou shalt not eat of it; cursed is the ground for thy sake; in sorrow shalt thou eat of it all the days of thy life. Thorns also and thistles shall it bring forth unto thee, and thou shall eat the herb of the field. In the sweat of thy face shalt thou eat bread till thou return unto the ground; for out of it wast thou taken: for dust thou art, and unto dust shalt thou return."

Here is a terrible denunciation of toil and misery and death upon two creatures; who, being inured to nothing, and formed for nothing but happiness, must have felt infinitely more horror from such a sentence, than we, who are familiar with death, intimate with misery, and "born to sorrow as the sparks fly upward," can form any adequate conception of. The hardship of it, too, seems to be aggravated by its being severer than what was originally threatened against the breach of the covenant of life. It was indeed said, "In the day thou eatest thereof, thou shalt surely die:" but no mention was made of the woman's incurring sorrow in conception, and in the bringing forth of children; of the curse to be inflicted on the ground; of its bringing forth thorns and thistles instead of food for the use of man; and of Adam's eating bread in sorrow and the sweat of his face till he should return to the dust from which he was taken.

106 An obscure intimation given them of deliverance from it.

These seeming aggravations, however, are in reality instances of divine benevolence. Adam and Eve were now subjected to death; but in the sentence passed on the serpent, an obscure intimation had been given them that they were not to remain for ever under its power. It was therefore their interest, as well as their duty, to reconcile themselves as much as possible to their fate; to wean their affections from this world, in which they were to live only for a time; and to hope, with humble confidence, in the promise of their God, that, upon their departure from it, they should be received into some better state. To enable them to wean their affections from earth, nothing could more contribute than to combine sensual enjoyment with sorrow, and lay them under the necessity of procuring their means of subsistence by labour, hard and often fruitless. This would daily and hourly impress upon their minds a full conviction that the present world is not a place fit to be an everlasting habitation; and they would look forward, with pious resignation, to death, as putting a period to all their woes. Had they indeed been furnished with no ground of hope beyond the grave, we cannot believe that the Righteous Judge of all the earth would have added to the penalty originally threatened. That penalty they would doubtless have incurred the very day on which they fell; but as they were promised a deliverance from the consequences of their fall, it was proper to train them up by severe discipline for the happiness reserved for them in a future state.

After the passing of their sentence, the man and woman were turned out into the world, where they had formerly lived before they were placed in the garden of Eden; and all future access to the garden was for ever denied them. They were not, however, in the same state in which they were originally before their introduction into Paradise: They were now conscious of guilt; doomed to severe labour; liable to sorrow and sickness, disease and death: and all these miseries they had brought, not only on themselves, but also on their unborn posterity to the end of time. It may seem indeed to militate against the moral attributes of God, to inflict misery on children for the sins of their parents; but before any thing can be pronounced concerning the Divine goodness and justice in the present case, we must know precisely how much we suffer in consequence of Adam's transgression, and whether we have ourselves any share in that guilt which is the cause of our sufferings.

107 Doubtful whether men would have been exempted from pain under the first covenant,

That women would have had less sorrow in the bringing forth of children; that we should have been subjected to less toil and exempted from death, had our first parents not fallen from their paradisaical state—are truths incontrovertible by him who believes the inspiration of the Holy Scriptures; but that mankind would in that state have been wholly free from pain and every bodily distress, is a proposition which is not to be found in the Bible, and which therefore no man is bound to believe. The bodies of Adam and Eve consisted of flesh, blood, and bones, as ours do; they were surrounded by material objects as we are; and their limbs were unquestionably capable of being fractured. That their souls should never be separated from their bodies while they abstained from the forbidden fruit, they knew from the infallible promise of him who formed them, and breathed into their nostrils the breath of life; but that not a bone of themselves or of their numerous posterity should ever be broken by the fall of a stone or of a tree, they were not told, and had no reason to expect. Of such fractures, pain would surely have been the consequence; though we have reason to believe that it would have been quickly removed by some infallible remedy, probably by the fruit of the tree of life.

Perhaps it may be said, that if we suppose our first parents or their children to have been liable to accidents of this kind in the garden of Eden, it will be difficult to conceive how they could have been preserved from death, as

Fall of Adam, and its consequences.

as a ſtone might have fallen on their heads as well as on their feet, and have at once deſtroyed the principle of vitality. But this can be ſaid only by him who knows little of the phyſical world, and ſtill leſs of the power of God. There are many animals which are ſuſceptible of pain, and yet not eaſily killed; and man in paradiſe might have reſembled theſe. At any rate, we are ſure that the Omnipotent Creator could and would have preſerved him from death; but we have no reaſon to believe that, by a conſtant miracle, he would have preſerved him from every kind of pain. Indeed, if, under the firſt covenant, mankind were in a ſtate of probation, it is certainly conceivable that ſome one individual of the numerous race might have fallen into ſin, without actually breaking the covenant by eating the fruit of the tree of knowledge; and ſuch a ſinner would undoubtedly have been puniſhed by that God who is of purer eyes than to behold iniquity: but how puniſhment could have been inflicted on a being exempted from all poſſibility of pain as well as of death, we confeſs ourſelves unable to imagine. Remorſe, which is the inſeparable conſequence of guilt, and conſtitutes in our preſent ſtate great part of its puniſhment, flows from the fearful looking for of judgment, which the ſinner knows ſhall, in a future ſtate, devour the adverſaries of the goſpel of Chriſt; but he, who could neither ſuffer pain nor death, had no cauſe to be afraid of future judgement, and was therefore not liable to the tortures of remorſe. We conclude, therefore, that it is a miſtake to ſuppoſe pain to have been introduced into the world by the fall of our firſt parents, or at leaſt that the opinion contrary to ours has no foundation in the word of God.

108 Death, however, was certainly introduced by their fall; for the inſpired apoſtle aſſures us, that in *Adam all die* *; and again, that *through the offence of ONE many are dead* †. But concerning the full import of the word *death* in this place, and in the ſentence pronounced upon our firſt parents, divines hold opinions extremely different. Many contend, that it includes death *corporal*, *ſpiritual* or *moral*, and *eternal*; and that all mankind are ſubjected to theſe three kinds of death, on account of their ſhare in the guilt of the original tranſgreſſion, which is uſually denominated *original ſin*, and conſidered as the ſource of all moral evil.

though they would from death.

* Cor. xv. 22.

† Rom. v. 15.

That all men are ſubjected to death corporal in conſequence of Adam's tranſgreſſion, is univerſally admitted; but that they are in any ſenſe partakers of his guilt, and on that account ſubjected to death ſpiritual and eternal, has been very ſtrenuouſly denied. To diſcover the truth is of great importance; for it is intimately connected with the Chriſtian doctrine of redemption. We ſhall therefore ſtate, with as much impartiality as we can, the arguments commonly urged on each ſide of this much agitated queſtion.

109 Doctrine of original ſin ſtated.

Thoſe who maintain that all men ſinned in Adam, generally ſtate their doctrine thus: "The covenant being made with Adam as a public perſon, not for himſelf only but for his poſterity, all mankind deſcending from him by ordinary generation *ſinned* in him and fell with him in that firſt tranſgreſſion; whereby they are deprived of that original righteouſneſs in which he was created, and are utterly indiſpoſed, diſabled, and made oppoſite to all that is ſpiritually good, and wholly inclined to all evil, and that continually; which is commonly called *original ſin*, and from which do proceed all actual tranſgreſſions, ſo as we are by nature children of wrath, bond-ſlaves to Satan, and juſtly liable to all puniſhments in this world and in that which is to come, even to everlaſting ſeparation from the comfortable preſence of God, and to moſt grievous torments in ſoul and body, without intermiſſion, in hell fire for ever."

Fall of Adam, and its conſequences.

That which in this paſſage we are firſt to examine, is the ſentence which affirms all mankind deſcending from Adam by ordinary generation to have *ſinned* in him and fallen with him in his firſt tranſgreſſion; the truth of which is attempted to be proved by various texts of Holy Scripture. Thus St Paul ſays expreſsly, that "by one man ſin entered into the world, and death by ſin; and ſo death paſſed upon all men, for that *all have ſinned*. But not as the offence, ſo alſo is the free gift. For if, through the *offence* of *one*, *many* be *dead*; much more the grace of God, and the gift by grace, which is by one man, Jeſus Chriſt, hath abounded unto many; and not as it was by one that ſinned, ſo is the gift (for the *judgment* was by *one* unto *condemnation*); but the free gift is of many offences unto juſtification. For if, by one man's offence, death reigned by one; much more they, who receive the abundance of grace and of the gift of righteouſneſs, ſhall reign in life by one, Jeſus Chriſt. Therefore as, by the *offence of one*, *judgment* came upon *all men* to *condemnation*; even ſo, by the righteouſneſs of One, the free gift came upon all men unto juſtification of life. For as by one man's diſobedience *many were made ſinners*; ſo by the obedience of one ſhall many be made righteous *." In this paſſage the apoſtle aſſures us, that all upon whom death hath paſſed have *ſinned*; but death hath paſſed upon infants, who could not commit actual ſin. Infants therefore muſt have ſinned in Adam, ſince death hath paſſed upon them; for death "is the wages only of ſin." He tells us likewiſe, that by the offence of one, judgment came upon all men to condemnation; and therefore, ſince the Righteous Judge of heaven and earth never condemns the innocent with the wicked, we muſt conclude, that all men partake of the guilt of that offence for which judgment came upon them to condemnation. Theſe concluſions are confirmed by his ſaying expreſsly, that "by one man's diſobedience many (*i. e.* all mankind) were *made ſinners*;" and elſewhere †, that "there is none righteous, no *not one*;" and that his Epheſian converts "were dead in treſpaſſes and ſins, and were by *nature* children of wrath even as *others*." The ſame doctrine, it is ſaid, we are taught by the inſpired writers of the Old Teſtament. Thus Job, expoſtulating with God for bringing into judgment with him ſuch a creature as man, ſays, "Who can bring a clean thing out of an unclean? Not one." And Eliphaz, reproving the patient patriarch for what he deemed preſumption, aſks ‡, "What is man that he ſhould be clean, or he who is born of a woman that he ſhould be righteous?" From theſe two paſſages it is plain, that Job and his unfeeling friend, though they agreed in little elſe, admitted as a truth unqueſtionable, that man inherits from his parents a ſinful nature, and that it is impoſſible for any thing born of a woman by ordinary generation to be righteous. The pſalmiſt talks the very ſame language; when acknowledging his tranſgreſſions, he ſays ||, "Behold I was ſhapen in iniquity, and in ſin did my mother conceive me."

110 Arguments for it.

* Rom. v. 12, 15—20.

† Rom. iii. 10. and Eph. ii. 1 and 3.

‡ Job xiv. 4. and xv. 14.

|| Pſalm li. 5.

Having

Fall of Adam, and its consequences.

111 Adam's guilt imputed to his posterity.

Having thus proved the fact, that all men are made sinners by Adam's disobedience, the divines, who embrace this side of the question, proceed to inquire how they can be partakers in guilt which was incurred so many ages before they were born. It cannot be by imitation; for infants, according to them, are involved in this guilt before they be capable of imitating any thing. Neither do they admit that sin is by the apostle put for the consequences of sin, and many said to be made sinners by one man's disobedience, because by that disobedience they were subjected to death, which is the wages of sin. This, which they call the doctrine of the Arminians, they affirm to be contrary to the whole scope and design of the context; as it confounds together sin and death, which are there represented, the one as the cause, and the other as the effect. It likewise exhibits the apostle reasoning in such a manner as would, in their opinion, disgrace any man of common sense, and much more an inspired writer; for then the sense of these words, "Death hath passed upon all men, for that all have sinned," must be, death hath passed upon all men, because it hath passed upon all men; or, all men are obnoxious to death, because they are obnoxious to it. The only way therefore, continue they, in which Adam's posterity can be made sinners through his disobedience, is by the IMPUTATION of his disobedience to them; and his imputation is not to be considered in a *moral* sense, as the action of a man committed by himself, whether good or bad, is reckoned unto him as his own; but in a *forensic* sense, as when one man's debts are in a legal way placed to the account of another. Of this we have an instance in the apostle Paul, who said to Philemon concerning Onesimus, "If he hath wronged thee, or oweth thee any thing (ελλογει), let it be imputed to me," or placed to and put on my account. And thus the posterity of Adam are made sinners by his disobedience; that being imputed to them and put to their account, as if it had been committed by them personally, though it was not.

Some few divines of this school are indeed of opinion, that the phrase, "By one man's disobedience many were made sinners," means nothing more than that the posterity of Adam, through his sin, derive from him a corrupt nature. But though this be admitted as an undoubted truth, the more zealous abettors of the system contend, that it is not the whole truth. "It is true (say they) that all men are made of one man's blood, and that blood tainted with sin; and so a clean thing cannot be brought out of an unclean. What is born of the flesh is flesh, carnal and corrupt: every man is conceived in sin and shapen in iniquity; but there is a difference between being *made sinners* and *becoming* sinful. The one respects the *guilt*, the other the *pollution* of nature; the one is previous to the other, and the foundation of it. Men receive a corrupt nature from their immediate parents; but they are made sinners, not by any act of their disobedience, but only by the imputation of the sin of Adam."

To illustrate this doctrine of imputed sin, they observe, that the word καθεσταθησαν, used by the apostle, signifies *constituted* in a judicial way, ordered and appointed in the dispensation of things that so it should be; just as Christ was made sin or a sinner by imputation, or by that constitution of God which laid upon him the sins of all his people, and dealt with him as if he had been the guilty person. That this is the sense of the passage, they argue further from the punishment inflicted on men for the sin of Adam. The punishment threatened to that sin was death; which includes death corporal, moral, and eternal. Corporal death, say they, is allowed by all to be suffered on account of the sin of Adam; and if so, there must be guilt, and that guilt made over to the sufferer, which can be done only by *imputation*. A moral death is no other than the loss of the image of God in man, which consisted in righteousness and holiness; and particularly it is the loss of original righteousness, to which succeeded unrighteousness and unholiness. It is both a sin and a punishment for sin; and since it comes on all men as a punishment, it must suppose preceding sin, which can be nothing but Adam's disobedience; the guilt of which is made over to his posterity by *imputation*. This appears still more evident from the posterity of Adam being made liable to eternal death in consequence of his transgression; for the wages of sin is death, even death eternal, which never can be inflicted on guiltless persons. But from the passage before us we learn, that "by the offence of *one* judgement came upon all men to condemnation;" and therefore the guilt of that offence must be reckoned to all men, or they could not be justly condemned for it. That Adam's sin is imputed to his posterity, appears not only from the words, "by one man's disobedience many were made sinners;" but likewise from the opposite clause, "so by the obedience of One shall many be made righteous;" for the many ordained to eternal life, for whom Christ died, are made righteous, or justified, only through the imputation of his righteousness to them; and therefore it follows, that all men are made sinners only through the imputation of Adam's disobedience.

Fall of Adam, and its consequences.

112 The punishment of imputed guilt.

To this doctrine it is said to be no objection that Adam's posterity were not in being when his sin was committed; for though they had not then actual being, they had yet a virtual and representative one. They were in him both *seminally* and *federally*, and sinned in him *; just as Levi was in the loins of Abraham, and paid in him tithes to Melchizedeck †. From Adam they derive a corrupt nature; but it is only from him, as their federal head, that they derive a share of his guilt, and are subjected to his punishment. That he was a federal head to all his posterity, the divines of this school think evident from his being called a figure of Christ ‡; and the first Adam described as natural and earthly, in contradistinction to Christ the second Adam described as spiritual and the Lord from heaven; and from the punishment threatened against his sin being inflicted not on himself only, but on all his succeeding offspring. He could not be a figure of Christ, say they, merely as a man; for all the sons of Adam have been men as well as he, and in that sense were as much figures of Christ as he; yet Adam and Christ are constantly contrasted, as though they had been the only two men that ever existed, because they were the only two heads of their respective offspring. He could not be a figure of Christ on account of his extraordinary production; for though both were produced in ways uncommon, yet each was brought into the world in a way peculiar to himself. The first Adam was formed of the dust of the ground; the second, though not begotton by a man, was born of a woman. They did not therefore resemble each other in the manner of their formation, but in their office as covenant-

* Rom. v. 12.

† Heb. vii. 9, 10.

113 Adam a federal head to his posterity.

‡ Rom. v. 14.

Fall of Adam, and its consequences.

covenant-heads; and in that alone the comparison between them is exact.

114 No cause of complaint in this constitution of things.

Nor have any of the posterity of Adam, it is said, reason to complain of such a procedure. Had he stood in his integrity, they would have been, by his standing, partakers of all his happiness; and therefore should not murmur at receiving evil through his fall. If this do not satisfy, let it be considered, that since God, in his infinite wisdom, thought proper that men should have a head and representative, in whose hands their good and happiness should be placed, none could be so fit for this high station as the common parent, made after the image of God, so wise, so holy, just, and good. Lastly, to silence all objections, let it be remembered, that what God gave to Adam as a federal head, relating to himself and his posterity, he gave as the Sovereign of the universe, to whom no created being has right to ask, "What dost thou *?"

* See *Gill's Body of Divinity.*

115 St Augustine the author of this doctrine.

Such are the consequences of Adam's fall, and such the doctrine of original sin, as maintained by the more rigid followers of Calvin. That great reformer, however, was not the author of this doctrine. It had been taught, so early as in the beginning of the fifth century, by St Augustine, the celebrated bishop of Hippo (see AUGUSTINE); and the authority of that father had made it more or less prevalent in both the Greek and Roman churches long before the Reformation. Calvin was indeed the most eminent modern divine by whom it has been held in all its rigour; and it constitutes one great part of that theological system which, from being taught by him, is now known by the name of *Calvinism.*

116 Objections to it,

But if it was as sovereign of the universe that God gave to Adam what he received in paradise relating to himself and his posterity, Adam could in no sense of the words be a federal head; because, upon this supposition, there was no covenant. The Sovereign of the universe may unquestionably dispense his benefits, or withhold them, as seems expedient to his infinite wisdom; and none of his subjects or creatures can have a right to say to him, What dost thou? But the dispensing or withholding of benefits is a transaction very different from the entering into covenants; and a judgement is to be formed of it on very different principles. Every thing around us proclaims that the Sovereign of the universe is a being of perfect benevolence; but, say the disciples of the school now under consideration, the dispensation given to Adam in paradise was so far from being the offspring of benevolence, that, as it is understood by the followers of Calvin, it cannot possibly be reconciled with the eternal laws of equity. The self-existent and all-sufficient God might or might not have created such a being as man; and in either case there would have been no reason for the question "What dost thou?" But as soon as he determined to create him capable of happiness or misery, he would not have been either benevolent or just, if he had not placed him a state where, by his own exertions, he might, if he chose, have a greater share of happiness than of misery, and find his existence, upon the whole, a blessing. They readily acknowledge, that the existence of any created being may be of longer or shorter duration, according to the good pleasure of the Creator; and therefore they have no objection to the apostolic doctrine, that "in Adam all die:" for immortality being not a debt, but a *free gift*, may be bestowed on any terms, and with perfect justice withdrawn when these terms are not complied with. Between death, however, as it implies a loss of consciousness, and the extreme misery of eternal life in torments, there is an immense difference. To death all mankind might justly be subjected through the offence of one; because they had originally no claim to be exempted from it, though that one and they too had remained for ever innocent: but eternal life in torments is a punishment which a God of justice and benevolence can never inflict but upon personal guilt of the deepest die. That we can personally have incurred guilt from a crime committed some thousands of years before we were born, is impossible. It is indeed a notion as contrary to Scripture as to reason and common sense: for the apostle expressly informs us *, "that sin is the transgression of some law;" and the sin of Adam was the transgression of a law which it was never in our power either to observe or to break. Another apostle † assures us, that "where no law is, there is no transgression"; but there is now no law, nor has been any these 5000 years, forbidding mankind to eat of a particular fruit; for, according to the Calvinists themselves ‡, Adam had no sooner committed his first sin, by which the covenant with him was broken, than he ceased to be a covenant-head. This law given him was no more; the promise of life by it ceased; and its sanction, death, took place. But if this be so, how is it possible that his unborn posterity should be under a law which had no existence, or that they should be in a worse state in consequence of the covenant being broken, and its promise having ceased, than he himself was before the covenant was first made? He was originally a mortal being, and was promised the supernatural gift of immortality on the single condition of his abstaining from the fruit of the tree of knowledge of good and evil. From that fruit he did not abstain; but by eating it fell back into his natural state of mortality. Thus far it is admitted that his posterity fell with him: for they have no claim to a supernatural gift which he had forfeited by his transgression. But we cannot admit, say the divines of this school, that they fell into his guilt; for to render it possible for a man to incur guilt by the transgression of a law, it is necessary not only that he have it in his power to keep the law, but also that he be capable of transgressing it by a *voluntary* deed. But surely no man could be capable of voluntarily eating the forbidden fruit 5000 years before he himself or his volitions existed. The followers of Calvin think it a sufficient objection to the doctrine of transubstantiation, that the same numerical body cannot be in different places at the same instant of time. But this ubiquity of body, say the remonstrants, is not more palpably absurd, than the supposition that a man could exert volitions before he or his will had any existence.

* 1 John iii. 4.

† Rom. iv. 15.

‡ *Gill's Body of Divinity*, b. iii. ch. 10.

117 as inconsistent with the justice of God,

118 the scripture, and the nature of things.

119 The word IMPUTATION removes no difficulties.

Nor will the introduction of the word *imputation* into this important question remove a single difficulty. For what is that we mean by saying that the sin of Adam is imputed to his posterity? Is the guilt of that sin transferred from him to them? So surely thought Dr Gill, when he said that it *is made over to them.* But this is the same absurdity as the making over of the sensible qualities of bread and wine to the internal substance of our Saviour's body and blood! This imputation either found the posterity of Adam guilty of his sin, or it made them so. It could not find them guilty for

Fall of Adam, and its consequences.

for the reason already assigned; as well as because the apostle says expressly, that for the offence of *one* judgement came upon *all* men, which would not be true had *all* offended. It could not make them guilty; for this reason, that if there be in physics or metaphysics a single truth self-evident, it is, that the numerical powers, actions, or qualities, of one being cannot possibly be transferred to another, and be made its powers, actions, or qualities. Different beings may in distant ages have qualities of the same kind; but as easily may 4 and 3 be made equal to 9, as two beings be made to have the same identical quality. In Scripture we nowhere read of the actions of one man being imputed to another. "Abraham (we are told) believed in God, and it was counted to him for righteousness;" but it was his *own* faith, and not the faith of another man, that was so counted. "To him that worketh not, but believeth, his faith (not another's) is imputed for righteousness." And of our faith in him that raised Christ from the dead, it is said, that "it shall be imputed, not to our fathers or our children, but to us for righteousness."

120 Meaning of that word in Scripture.

When this phrase is used with a negative, not only is the man's own personal sin spoken of, but the non-imputation of that sin means nothing more but that it brings not upon the sinner condign punishment. Thus when Shemei "said unto David, Let not my lord *impute* iniquity unto me;" it could not be his meaning that the king should not think that he had offended; for with the same breath he added, "Neither do thou remember that which thy servant *did perversely*, the day that my lord the king went of Jerusalem, that the king should take it to his *heart*. For thy servant doth *know* that *I have sinned*." Here he plainly confesses his sin, and declares, that by intreating the king not to *impute it to him*, he wished only that it should not be so remembered as that the king should take it to heart, and punish him as his perverseness deserved. When therefore it is said *, that "God was in Christ reconciling the world to himself, not imputing to them their iniquities, the meaning is only that for Christ's sake he was pleased to exempt them from the punishment due to their sins. In like manner, when the prophet, foretelling the sufferings of the Messiah, says, that "the Lord laid on him the iniquity of us all," his meaning cannot be, that the Lord by *imputation* made his immaculate Son guilty of all the sins that men have ever committed; for in that case it would not be true that the "just suffered for the unjust," as the apostle expressly teaches †: but the sense of the verse must be, as Bishop Coverdale translated it, "through him the Lord pardoneth all our sins." This interpretation is countenanced by the ancient version of the Seventy, και Κυριος παρεδωκεν αυτον ταις αμαρτιαις ημων; words which express a notion very different from that of imputed guilt. The Messiah was, without a breach of justice, delivered for sins of which he had voluntarily offered to pay the penalty; and St Paul might have been justly charged by Philemon with the debts of Onesimus, which he had desired might be placed to his account. Had the apostle, however, expressed no such desire, surely Philemon could by no deed of his have made him liable for debts contracted by another; far less could he by *imputation*, whatever that word may mean, have made him virtually concur in the contracting of those debts. He could not have been justly subjected to suffering without his own consent; and he could not possibly have been made guilty of the sins of those for whom he suffered.

* 2 Cor. v. 19.

† 1 Peter iii. 18.

The doctrine of imputed guilt therefore, as understood by the Calvinists, is, in the opinion of their opponents, without foundation in Scripture, and contrary to the nature of things. It is an impious absurdity (say they), to which the mind can never be reconciled by the hypothesis, that all men were in Adam both seminally and federally, and sinned in him, as Levi paid tithes to Melchizedeck in the loins of Abraham. The apostle, when he employs that argument to lessen in the minds of his countrymen the pride of birth and the lofty opinions entertained of their priesthood, plainly intimates, that he was using a bold figure, and that Levi's paying tithes is not to be understood in a strict and literal sense. "Now consider (says he) how great this man was, unto whom even the patriarch Abraham gave the tenth of the spoils. And, *as I may so say*, Levi also, who receiveth tithes, paid tithes in Abraham: for he was yet in the loins of his father when Melchizedeck met him." This is a very good argument to prove that the Levitical priesthood was inferior in dignity to that of Melchizedeck; and by the apostle it is employed for no other purpose. Levi could not be greater than Abraham, and yet Abraham was inferior to Melchizedeck. This is the whole of St Paul's reasoning, which lends no support to the doctrine of original sin, unless it can be shown that Levi and all his descendants contracted from this circumstance such a strong propensity to the *paying* of tithes, as made it a matter of extreme difficulty for them, in every subsequent generation, to comply with that part of the divine law which constituted them *receivers* of tithes. That all men were seminally in Adam, is granted; and it is likewise granted that they may have derived from him, by ordinary generation, diseased and enfeebled bodies: but it is as impossible to believe that moral guilt can be transmitted from father to son by the physical act of generation, as to conceive a scarlet colour to be a cube of marble, or the sound of a trumpet a cannon ball. That Adam was as fit a person as any other to be entrusted with the good and happiness of his posterity, may be true; but there is no fitness whatever, according to the Arminians, in making the everlasting happiness or misery of a whole race depend upon the conduct of any fallible individual. "That any man should so represent me (says Dr Taylor *), that when he is guilty, I am to be reputed guilty; when he transgresses, I shall be accountable and punishable for his transgression; and this before I am born, and consequently before I am in any capacity of knowing, helping, or hindering, what he doth: all this every one who useth his understanding must clearly see to be false, unreasonable, and altogether inconsistent with the truth and goodness of God." And that no such appointment ever had place, he endeavours to prove, by showing that the texts of Scripture upon which is built the doctrine of the Calvinists respecting original sin, will each admit of a very different interpretation.

121 Moral guilt cannot be transmitted from father to son.

* *Doctrine of Original Sin*, part iii.

122 The several texts on which this doctrine is built capable of a different interpretation.

One of the strongest of these texts is Romans v. 19. which we have already quoted, and which our author thus explains. He observes, that the apostle was a Jew, familiarly acquainted with the Hebrew tongue; that he wrote his epistle as well for the use of his own countrymen residing in Rome, as for the benefit of the Gentile converts; and that though he made use of the Greek language,

Fall of Adam, and its consequences.

language, as most generally understood, he frequently employed Hebrew idioms. Now it is certain that the Hebrew words חטאה and עון "sin and iniquity," are frequently used in the Old Testament to signify *suffering*, by a figure of speech which puts the effect for the cause; and it is surely more probable, that in the verse under consideration, the apostle used the corresponding Greek word ἁμαρτωλοι in the Hebrew sense, than that he meant to contradict what he had said in the former verse, by teaching that all men were made guilty of an act of disobedience committed thousands of years before the majority of them had any being. In the preceding verse he says, "that by the offence of one, judgement came upon all men to condemnation." But this cannot be true, if by that offence all men were made sinners; for then judgement must have come upon each for his own share in the original disobedience. "Any one may see (says our author) that there is a vast difference between a man's making *himself* a sinner by his *own* wicked act, and his being made a sinner by the wicked act of *another*. In the latter case, he can be a sinner in no other sense but as he is a sufferer; just as Lot would have been made a sinner with the Sodomites, had he been consumed in the iniquity of the city *; and as the subjects of Abimelech would have been made sinners, had he, in the integrity of his heart, committed adultery with Abraham's wife †. That the people of Gerar could have contracted any real guilt from the adultery of their sovereign, or that he, by lying with a woman whom he had reason to believe to be not the wife but the sister of another man, would have incurred all the moral turpitude of that crime, are positions which cannot be maintained. Yet he says, that Abraham had brought upon him and on his kingdom a *great sin*; though it appears, from comparing the 6th verse with the 17th and 18th, that he had not been brought under sin in any other sense than as he was made to suffer for taking Sarah into his house. In this sense, "Christ, though we are sure that he knew no sin, was made sin for us, and numbered with the transgressors," because he suffered death for us on the cross; and in this sense it is true, that by the disobedience of Adam all mankind were made sinners, because, in consequence of his offence, they were by the judgement of God made subject to death.

* Gen. xix. 15.

† Gen. xx.

But it may be thought that this interpretation of the words *sin* and *sinners*, though it might perhaps be admitted in the 19th verse, cannot be supposed to give the apostle's real meaning, as it would make him employ in the 12th verse an absurd argument, which has been already noticed. But it may perhaps be possible to get quit of the absurdity, by examining the original text instead of our translation. The words are, και ουτως εις παντας ανθρωπους ο θανατος διηλθεν εφ ω παντες ημαρτον. In order to ascertain the real sense of these words, the first thing to be done is to discover the antecedent to the relative ω. Our translators seem to consider it as used absolutely without any antecedent; but this is inaccurate, as it may be questioned whether the relative was ever used in any language without an antecedent either expressed or understood. Accordingly, the Calvinist critics, and even many Remonstrants, consider ενος ανθρωπου in the beginning of the verse as the antecedent to ω in the end of it, and translate the clause under consideration thus: "And so death hath passed upon all men, in whom (viz. Adam) all have sinned." Θανατος, however, stands much nearer to ω than ανθρωπου; and being of the same gender, ought, we think, to be considered as its real antecedent: but if so, the clause under consideration should be thus translated: "and so death hath passed upon all men, unto which (o) all have sinned, or, as the Arminians explain it, have suffered. If this criticism be admitted as just, εφ ω must be considered as standing here under a particular emphasis, denoting the utmost length of the consequences of Adam's sin (p); as if the apostle had said, "so far have the consequences of Adam's sin extended, and spread their influence among mankind, introducing not only a curse upon the earth, and sorrow and toil upon its inhabitants, but even DEATH, UNIVERSAL DEATH, in every part, and in all ages of the world." His words (say the Remonstrants) will unquestionably bear this sense; and it is surely much more probable that it is their true sense, than that an inspired writer should have taught a doctrine subversive of all our notions of right and wrong, and which, if really embraced, must make us incapable of judging when we are innocent and when guilty.

When the apostle says that there is none righteous, no not one, he gives us plainly to understand that he is quoting from the 14th Psalm; and the question first to be answered is, In what sense were these words used by the Psalmist? That they were not meant to include all the men and women then living, far less all that have ever lived, is plain from the fifth verse of the same Psalm, where we are told that those wicked persons "were in great fear, because God was in the congregation of the *righteous*." There was then, it seems, a congregation of righteous persons, in opposition to those called the *children of men*, of whom alone it is said that there was none that did good, no not one. The truth is, that the persons of whom David generally complains in the book of Psalms, constituted a strong party disaffected to his person and government. That faction he describes as proud and oppressive, as devising mischief against him, as violent men continually getting together for war. He styles them his *enemies*; and sometimes characterizes them by the appellation which was given to the apostate descendants of Cain before the deluge. Thus in the 57th Psalm, which was composed when he fled from Saul to the cave in which he spared that tyrant's life, he complains, "I lie among them that are set on fire, even the SONS OF MEN, whose teeth are spears," &c.; and

(o) That επι, when construed with a dative case, often signifies *to* or *unto*, is known to every Greek scholar. Thus επ' ευδοξια οδος, *the way to fame*, (Lucian.). Κακουργος επι τω θανατω, *a criminal unto death*, (Demosth.). Επι θανατω συλλαβειν, *to carry to death or execution*, (Isoc.). Υμεις επ ελευθερια εκληθητε, *ye have been called to liberty*, (Gal. v. 13.). Κτισθεντες εν Χριστω Ιησου επι εργοις αγαθοις, *created in Christ Jesus unto good works*, (Ephes. ii. 10.). See also 1 Thes. iv. 7.; 2 Tim. ii. 14.; and many other places of the New Testament.

(p) Εφ' ω has likewise this import, denoting the *terminus ad quem* in Phil. iii. 12. and iv. 10.

Fall of Adam, and its consequences.

and again, in the 58th Psalm, he says, "Do ye indeed speak righteousness, O congregation? Do ye judge uprightly, O ye sons of men?" By comparing these texts with 1 Sam. xxvi. 19. it will appear evident that by the SONS OF MEN mentioned in them, he meant to characterize those enemies who exasperated Saul against him. Now it is well known, that there was a party adhering to the interests of the house of Saul, which continued its enmity to David during the 40 years of his reign, and joined with Absalom in rebellion against him only eight years before his death. But it is the opinion of the most judicious commentators †, that the 14th Psalm was composed during the rebellion of Absalom; and therefore it is surely much more probable, that by *the children of men*, of whom it is said there is "none that doth good, no not one," the inspired poet meant to characterize the rebels, than that he should have directly contradicted himself in the compass of two sentences succeeding each other. Had he indeed known that all the children of men, as descending from Adam, "are utterly indisposed, disabled, and made opposite to all that is spiritually good, and wholly and continually inclined to all evil," he could not, with the least degree of consistency, have represented the Lord as looking down from heaven upon them, to see if there were any that did understand and seek after God;" but if by the children of men was meant only the rebel faction, this scenical representation is perfectly consistent, as it was natural to suppose that there might be in that faction some men of good principles misled by the arts of the rebel chiefs.

† *Hammond*, &c.

Having thus ascertained the sense of the words as originally used by the Psalmist, the Arminian proceeds to inquire for what purpose they were quoted by the apostle; and in this inquiry he seems to find nothing difficult. The aversion of the Jews from the admission of the Gentiles to the privileges of the gospel, the high opinion which they entertained of their own worth and superiority to all other nations, and the strong persuasion which they had that a strict obedience to their own law was sufficient to justify them before God, are facts universally known; but it was the purpose of the apostle to prove that all men stood in need of a Redeemer, that Jews as well as Gentiles had been under the dominion of sin, and that the one could not in that respect claim any superiority over the other. He begins his epistle, therefore, with showing the extreme depravity of the Heathen world; and having made good that point, he proceeds to prove, by quotations from the book of Psalms, Proverbs, and Isaiah, that the Jews were in nowise better than they, that every mouth might be stopped, and all the world become guilty, or insufficient for their own justification before God.

The next proof brought by the Calvinists in support of their opinion, that all men derive guilt from Adam by ordinary generation, is that text in which St Paul says that the Ephesians "were by *nature* children of wrath even as others." To this their opponents reply, that the doctrine of original sin is in this verse, as in the last quoted, countenanced only by our translation, and not by the original Greek as understood by the ancient fathers of the Christian church, who were greater masters of that language than we. The words are και ημεν τεκνα φυσει οργης; in which it is obvious, that τεκνα, though in its original sense it signifies the genuine children of parents by natural generation, cannot be so understood here; because no man was ever begotten by, or born of, the abstract notion *wrath*. It must therefore be used figuratively; and in other places of scripture it often denotes a close relation to any person or thing. Thus we read of the children of *God*, of the *kingdom*, the *resurrection*, *wisdom*, *light*, *obedience*, and *peace*; whence it is concluded, that by the children of wrath are meant those who are liable to punishment or rejection. And because there were in those days some children, in a lower and less proper sense, by *adoption*, and others, in a higher and more proper sense, by *natural generation*, of whom the relation of the latter to their parents was much closer than that of the former; the apostle tells the Ephesians, that they were by *nature* children of wrath, to convince them that they were *really* liable to it by the strictest and closest relation possible. That the word φυσει here is of the same import with *really* or *truly*, and that it does not signify what we mean by *nature* in the proper sense of that word, the ancient fathers are generally agreed *; and that the modern Greeks, who still speak a dialect of the noble language of their ancestors, understand the word in the same sense, is apparent from their version of the text before us. In the most correct and elegant edition of the New Testament in their vernacular tongue, the words under consideration are thus rendered; και φυσικα ημασθαν τεκνα οργης ωσαν και οι λοιποι, where it is impossible that φυσικα can signify *natural*, otherwise the apostle will be made to say, not that we are by nature derived from Adam liable to wrath, but that we were *naturally begotten* by *wrath* in the abstract! For taking the word φυσει in the sense of *really* or *truly*, both the ancient and modern Greeks appear indeed to have the authority of St Paul himself; who, writing to Timothy, calls him γνησιον τεκνον, "his true or genuine son;" not to signify that he was the child of the apostle by natural generation, but that he was closely related to him in the faith to which St Paul had converted him. That the words τεκνα φυσει οργης can signify nothing but *truly* or *really relations to wrath*, is still farther evident from the ground assigned of that relation. It is not the sin of Adam, or the impurity of natural generation, "but the trespasses and sins in which the Ephesians in time past *walked*, according to the course of the world, according to the prince of the power of the air," the the spirit that at the time of the apostle's writing "worked in the children of disobedience." Surely no man can suppose that the Ephesians at any past time *walked* in Adam's trespass and sin, or that the prince of the power of the air tempted *them* to eat the forbidden fruit.

* See *Hammond* and *Whitby* on the Text, and *Suidas* on the word φυσις.

Having thus commented on the principal texts which are cited from the New Testament to prove the doctrine of original sin, the Arminians treat those which are quoted from the Old Testament, in support of the same doctrine, with much less ceremony. Thus, when Job says, "who can bring a clean thing out of an unclean? Not one," he is speaking, say they, not of the pravity of our nature, but of its frailty and weakness, of the shortness and misery of human life. The sentence is proverbial; and as it is used only to signify, that nothing can be more perfect than its original, it must, whenever it occurs, be understood according to the subject to which it is applied. That in the place under consideration

Fall of Adam, and its consequences.

tion it refers to our mortality, they think plain from the context; and Dr Taylor adds *, with some plausibility, that if the words refer to the guilt which we are supposed to derive from Adam, they will prove too much to serve the common scheme of original sin. They will prove that our natural and inherent pravity, so far from rendering us fit subjects of wrath, may be urged as a reason why God should not even bring us into judgement; for the patriarch's whole expostulation runs thus, "Dost thou open thine eyes upon such a one, and bringest me into judgement with thee? Who can bring a clean thing out of an unclean?"

* *Scripture Doctrine*, part ii.

The other text, quoted from the same book, they think still less to the purpose; for Eliphaz is evidently contrasting the creature with the Creator; in comparison with whom, he might well say, without alluding to original guilt, "what is man that he should be clean? and he who is born of a woman that he should be righteous? Behold he putteth no trust in his saints; yea the *heavens* are not clean in his sight. How much more abominable and filthy is man, who drinketh iniquity like water?" He does not say, who derives by birth an iniquitous nature; for he knew well, that as we are born, we are the pure workmanship of God, "whose hands have fashioned and formed every one of us;" but "who *drinketh* iniquity like water," who maketh himself iniquitous by running headlong into every vicious practice.

Of the text quoted from the fifty-first psalm in support of the doctrine of original sin, Dr Taylor labours †, by a long and ingenious criticism, to prove that our translators have mistaken the sense. The word which they have rendered *shapen*, he shows to be used once by Isaiah, and twice in the book of Proverbs, to signify *brought forth*; and that which is rendered *conceived me*, is never, he says, employed in scripture to denote human conception. In this last remark, however, he is contradicted by a great authority, no less indeed than that of Mr Parkhurst ‡, who says, that the LXX constantly render it by κισσαω or εγκισσαω, and the Vulgate generally by *concipio*. Without taking upon us to decide between these two eminent Hebrew scholars, we shall only observe, that upon one occasion || it certainly denotes ideas much grosser than those which the Psalmist must have had of his mother's conception; and that there, at least, Dr Taylor properly translates it, *incalescebant*, adding, "de hoc vero incalescendi genere loqui Davidem nemo sanus existimare potest. Matrem enim incaluisse, aut ipsum calefecisse eo modo quo incalescerent Jacobi pecudes Regem dicere, prorsus indecorum et absurdum." He contends, however, that the original force of the word is *to be hot*, and that it is applied to *conception*, to *resentment*, to *warmth* by which the body is nourished, to *idolaters* in love with idols, and to the heat of metals. The heat of idolaters, of resentment, and of metals, are evidently foreign to the Psalmist's purpose; and the idea conveyed by the word *incalescere* being set aside for the reasons already assigned, there remains only the warmth by which the body is nourished, and of that warmth our author is confident that David spoke.

† *Ubi supra.*

‡ See his *Lexicon* on the word יחם.

|| Gen, xxx. 38, 39, 40. compared with xxxi. 10.

If this criticism be admitted, the whole verse will then run thus: "Behold I was born in iniquity, and in sin did my mother nurse me;" which hath no reference to the original formation of his constitution, but is a periphrasis of his being a *sinner from the womb*, and means nothing more than that he was a *great sinner*, or had contracted *early habits* of sin. He no more designed to signify in this verse, that by ordinary generation he had a nature conveyed to him which was "utterly indisposed, disabled, and opposite to all that is spiritually good, and wholly and continually inclined to evil," than he meant in another * to signify strictly and properly that "the wicked are estranged from the womb, and TELL LIES as soon as they are born;" or that Job meant to signify †, that from the moment he came from his mother's womb he had been a guide to the widow and a succour to the fatherless. All these are hyperbolical forms of expression; which, though they appear strained, and perhaps extravagant, to the phlegmatic inhabitants of Europe, are perfectly suited to the warm imaginations of the orientals, and to the genius of eastern languages. They mean not that Job was *born* with *habits* of *virtue*, that the wicked actually *walked*, and *spoke*, and *spoke lies* from the instant of their *birth*, or that the Psalmist was really *shapen* in *sin* and *conceived in iniquity*. This last sentence, if interpreted literally, would indeed be grossly impious: it would make the inspired penman throw the whole load of his iniquity and sin from off himself upon *him* who shaped, and upon *her* who conceived him; even upon that God "whose hands had made him and fashioned him, and whom he declares that he will praise for having made him fearfully and wonderfully," and upon that parent who conceived him with sorrow, and brought him forth with pain, and to whom the divine law commanded him to render honour and gratitude. "But if, after all (says Dr Taylor ‡), you will adhere to the literal sense of the text for the common doctrine of *original sin*, show me any good reason why you ought not to admit the literal sense of the text, *this is my body*, for *transubstantiation?* If you say, it is absurd to suppose that Christ speaks of his real natural body; I say, it is likewise absurd to suppose that the Psalmist speaks of his being really and properly shapen in iniquity, and conceived in sin. If you say, that the sense of the words *this is my body* may be clearly explained by other texts of scripture where the like forms of speech are used; I say, and have shown, that the Psalmist's sense may as clearly and evidently be made out by parallel texts, where you have the like kind of expression. If you say that transubstantiation is attended with consequences hurtful to piety, I say that the common doctrine of original sin is attended with consequences equally hurtful; for it is a principle apparently leading to all manner of iniquity to believe that sin is natural to us, that it is interwoven and ingrafted into our very constitution from our conception and formation in the womb."

* Ps. lviii. 3.

† Job xxxi. 18.

‡ *Scripture Doctrine*, part ii.

123 Consequences of eating the forbidden fruit, according to the Arminians.

The Arminians having thus, as they think, proved that the posterity of Adam are not in any sense rendered guilty by his sin, contend, that the death threatened against his eating of the forbidden fruit, and which, in consequence of his transgression, came upon all men, can mean nothing more than the loss of that vital principle which he received when God breathed into his nostrils the breath of life, and he became a living soul. Every thing beyond this is pure conjecture, which has no foundation in the scriptures of truth, and is directly contrary to all the notions of right and wrong which

Fall of Adam, and its consequences.

we have been able to acquire from the ſtudy of thoſe very ſcriptures. It is not conceivable from any thing in the hiſtory, that Adam could underſtand it of the loſs of any other life than that which he had lately received, for no other life is ſpoken of to which the threatened death can be oppoſed; and in ſuch circumſtances it was ſtrange indeed, if by the word *death* he underſtood either eternal life in miſery, or a neceſſity of continuing in ſin. The ſenſe therefore of the threatening, ſay they, is this: "I have formed thee of the duſt of the ground, and breathed into thy noſtrils the breath of life; and thus thou art become a living ſoul. But if thou eateſt of the fruit of the tree of knowledge of good and evil, thou ſhalt ceaſe to be a living ſoul; for I will take from thee the breath of life, and thou ſhalt return to the duſt of which thou waſt formed."

124 Some of them admit the depravity of human nature,

Thus far the Arminians of the preſent day are agreed in oppoſing the doctrine of the rigid Calviniſts, and in ſtating their own notions of the conſequences of Adam's fall; but from that event their adverſaries deduce one conſequence, which ſome of them admit and others deny. It is ſaid, that though we cannot poſſibly be partakers in Adam's guilt, we yet derive from him a moral taint and infection, by which we have a natural propenſity to ſin; that having loſt the image of God, in which he was created, Adam begat ſons in his own image; and in one word, that the ſenſual appetites of human nature were inflamed, and its moral and intellectual powers greatly weakened by the eating of the forbidden fruit. The heathens themſelves acknowledged and lamented this depravity; though they were ignorant of the ſource from which it ſprung. The ſcriptures aſſert it, affirming that no man can be born pure and clean; that whatever is born of the fleſh, or comes into the world by ordinary generation, is fleſh, carnal and corrupt; that the imagination of the thoughts of man's heart is only evil continually; that the heart is deceitful above all things and deſperately wicked; and that out of it proceeds all that is vile and ſinful *.

* Job xiv. 4. John iii. 6. Rom. iii. 5. Jer. xvii. 9. Mat. xv. 19.

125 and illuſtrate it upon principles of natural knowledge;

This depravity of human nature, thus clearly deducible from ſcripture, and confirmed by the teſtimony of ages, an ingenious writer of the moderate Arminian ſchool undertakes to illuſtrate upon the principles of natural knowledge. "We know (ſays he †), that there are ſeveral fruits in ſeveral parts of the world of ſo noxious a nature as to deſtroy the beſt human conſtitution on earth. We alſo know that there are ſome fruits in the world which inflame the blood into fevers and frenzies; and we are told that the Indians are acquainted with a certain juice, which immediately turns the perſon who drinks it into an idiot, leaving him at the ſame time in the enjoyment of his health and all the powers of his body. Now I aſk Whether it be not poſſible, nay whether it be not rational, to believe, that the ſame fruit, which, in the preſent infirmity of nature, would utterly deſtroy the human conſtitution, might, in its higheſt perfection, at leaſt diſturb, impair, and diſeaſe it? and whether the ſame fruit, which would now inflame any man living into a fever or frenzy, might not inflame Adam into a turbulence and irregularity of paſſion and appetite? and whether the ſame fluids, which inflame the blood into irregularity of paſſion and appetite, may not naturally produce infection and impair the conſtitution? That the forbidden fruit had the effect to produce irregularity of appetite, appears as from other proofs, ſo I think fully and clearly from the covering which Adam and Eve made uſe of ſoon after their offence; for there is no imaginable reaſon for that covering but one, and that one ſufficiently demonſtrates, that irregularity and violence of appetite, independent of the dominion of reaſon, was the effect of their offence. But the fruit which inflamed the ſenſual appetite might likewiſe debaſe their rational powers; for I aſk, whether the ſame juice, which now affects the brain of an ordinary man ſo as to make him an idiot, might not affect the brain of Adam ſo as to bring his underſtanding down to the preſent ſtandard of ordinary men? And if this be poſſible, and not abſurd to be ſuppoſed, it is evident that the ſubſequent ignorance and corruption of human nature may be clearly accounted for upon theſe ſuppoſitions; nay, I had almoſt ſaid upon any one of them. For it is univerſally known, that the infections and infirmities of the father affect the children yet in his loins; and if the mother be equally infected, muſt, unleſs removed by proper remedies, affect their poſterity to the end of the world, or at leaſt till the race become extinct. Therefore why all mankind might not by their firſt father's ſin be reduced to the ſame condition of infirmity and corruption with himſelf, eſpecially when the mother was equally infirm, and infected, I believe no man anyway ſkilled in the knowledge of nature will ſo much as pretend to ſay."

† *Delany's Revelation examined with candour*, Diſſert. 1. and 7.

This account of the corruption of human nature ſeems to be generally adopted by moderate divines, as well among the Calviniſts as among the Arminians; but by the high-fliers in both ſchools it is rejected, on different principles indeed, with great indignation. The zealous Calviniſt contends, that this hereditary corruption is not to be accounted for or explained by any principle of phyſical ſcience, ſince it is part of that puniſhment which was inflicted on the race for their original ſin. If we were not partakers of Adam's guilt, ſay they, we ſhould not have been partakers of his corruption. The one is previous to and the foundation of the other. The depravity of human nature is a puniſhment for ſin? and ſo it was threatened to Adam, and came upon him as ſuch, and ſo to all his poſterity, by the *ordination* and *appointment of God;* for which there can be no other foundation but the imputation of Adam's diſobedience to them, nor can any thing elſe vindicate the righteouſneſs of God. For if the law of nature was ſufficient, why ſhould this *original* taint infect men rather than the ſins of their immediate parents †?"

† *Gill's Body of Divinity*, book iii. ch. 10, 11. and 13.

126 whilſt others reject the doctrine,

The more violent Arminians, on the other hand, deny that we inherit any moral taint whatever from Adam, or that the rational powers of our minds are naturally weaker than his were. Of that wonderful degree of perfection which is uſually attributed to the firſt pair, they find no evidence in ſcripture. All that we learn of them, ſay they, is, that they fell from a ſtate of exquiſite happineſs by yielding to a temptation leſs powerful by far than ſome others which many of their degenerate ſons have ſucceſsfully reſiſted. "I leave you to judge (ſays Dr Taylor ‡), whether Joſeph, when he reſiſted the ſolicitations of his miſtreſs, and Moſes when he refuſed to be called the ſon of Pharaoh's daughter, choofing rather to ſuffer affliction with the people of God than to enjoy the pleaſures of ſin for a ſeaſon, eſteeming the reproach of true religion greater riches than the treaſures of Egypt, did not exhibit proofs of regularity

‡ *Scripture Doctrine*, &c.

Fall of Adam, and its consequences.

regularity of paſſions and appetites equal at leaſt to what Adam diſplayed in the garden of Eden. When the three young men mentioned in the book of Daniel ſubmitted to be burnt alive in a fiery furnace rather than worſhip Nebuchadnezzar's golden image; when Daniel himſelf reſolved, rather than conceal the worſhip of God for one month only of his life, to be torn in pieces by hungry lions; and, to come nearer to our own times, when numbers of men and women, during the reign of Mary queen of England, choſe rather to be burnt at a ſtake than renounce the reformed religion and embrace the errors of popery—ſurely all theſe perſons exhibited a virtue, a faith in God, and a ſteady adherence to what they believed to be the truth, far ſuperior to what Adam diſplayed, when his wife gave him of the forbidden fruit, and he did eat." If it be ſaid that theſe perſons were ſupported under their trials by the grace of God ſtrengthening them, the ſame will be ſaid of Adam. He was undoubtedly ſupplied with every aid from the ſpirit of grace which was neceſſary to enable him to fulfil his duty; for being deſigned for more than mere animal life, even for the refined enjoyments of heaven, there is every reaſon to believe, as we have already obſerved, that he was put under the guidance of the Holy Ghoſt, to train him for that ſupernatural ſtate of felicity. Theſe communications of the ſpirit would of courſe be withdrawn when he forfeited his right to thoſe privileges, on account of which they were originally vouchſafed to him; but that any poſitive malignity or taint was infuſed into his nature, that his mere rational powers were weakened, or his appetites inflamed by the forbidden fruit, there is no evidence to be found in ſcripture, or in the known conſtitution of things. The attributing of this ſuppoſed hereditary taint to the noxious qualities of the forbidden fruit, is a whimſical hypotheſis, which receives no countenance from any well authenticated fact in natural hiſtory. After the numberleſs falſehoods that have been told of the poiſon tree of Java, ſomething more would be requiſite than the common evidence of a lying voyager to give credit to the qualities of the Indian tree, of which the fruit inſtantly turns the wiſeſt man into an idiot: and yet for this ſingular ſtory our ingenious author vouchſafes not even that evidence, ſlight as it generally is. The inference drawn from the covering uſed by our firſt parents is contradicted by every thing that we know of human nature; for ſurely no man, inflamed to the utmoſt with the fire of animal love, ever turned his eyes from a naked beauty ready and eager to receive him to her embrace. Yet this, it ſeems, was the behaviour of Adam and Eve in ſuch a ſtate! According to our author, the juice of the forbidden fruit had rendered their carnal appetites violent and independent of reaſon; according to the ſcripture, they were both naked; and as they were huſband and wife, there was no law prohibiting them from gratifying theſe inflamed appetites. In ſuch circumſtances, how did they conduct themſelves? One would naturally imagine that they immediately retired to ſome ſhady grove, and pleaſed themſelves in all the ſoft dalliances of wedded love. Their conduct, however, was very different. We are told, that "they ſewed fig-leaves together, and made themſelves aprons to cover their nakedneſs:" And this tranſaction is brought as a proof of the impetuoſity of their carnal appetites. The truth is, that the carnal appetite appears

127 and deem the phyſical illuſtration of it whimſical;

not to be naturally more violent than is neceſſary to anſwer the end for which it was implanted in the human conſtitution. Among ſavages the deſires of animal love are generally very moderate; and even in ſociety they have not often, unleſs inflamed by the luxurious arts of civil life, greater ſtrength than is requiſite to make mankind attend to the continuation of their ſpecies. In the decline of empires highly poliſhed, where the difference of rank and opulence is great, and where every man is ambitious of emulating the expence of his immediate ſuperiors, early marriages are prevented by the inability of moſt people to provide for a family in a way ſuitable to what each is pleaſed to conſider as his proper ſtation; and in that ſtate of things the violence of animal love will indeed frequently produce great irregularities. But for that ſtate of things, as it was not intended by the Author of nature, it is perhaps unreaſonable to ſuppoſe that proviſion ſhould be made; and yet we believe it will be found, upon due conſideration, that if the deſires of animal love were leſs violent than they are, the general conſequences would be more pernicious to ſociety than all the irregularities and vices which theſe deſires now accidentally produce; for there would then be no intercourſe between the ſexes whatever except in the very higheſt ſtations of life. That our conſtitution is attended with many ſenſual appetites and paſſions, is true; and that there is a great danger of their becoming exceſſive and irregular in a world ſo full of temptation as ours is, is alſo true; but there is no evidence that all this is the conſequence of Adam's fall, and far leſs that it amounts to a *natural propenſity* to ſin. For I preſume (ſays Dr Taylor), that by a natural propenſity is meant a neceſſary inclination to ſin, or that we are neceſſarily ſinful from the original bent and bias of our natural powers. But this muſt be falſe; for then we ſhould not be ſinful at all, becauſe that which is neceſſary, or which we cannot help, is not ſin. That we are weak and liable to temptation, is the will of God holy and good, and for glorious purpoſes to ourſelves; but if we are wicked, it muſt be through our own fault, and cannot proceed from any conſtraint, or neceſſity, or taint in our conſtitution."

128 maintaining that we have no natural propenſity to ſin.

Thus have we given as full and comprehenſive a view as our limits will permit of the different opinions of the Calviniſts and Arminians reſpecting the conſequences of Adam's fall. If we have dwelt longer upon the ſcheme of the latter than of the former, it is becauſe every Arminian argument is built upon criticiſm, and appeals to the original text; whilſt the Calviniſts reſt their faith upon the plain words of ſcripture as read in our tranſlation. If we might hazard our own opinion, we ſhould ſay that the truth lies between them, and that it has been found by the moderate men of both parties, who, while they make uſe of different language, ſeem to us to have the ſame ſentiments. That all mankind really ſinned in Adam, and are on that account liable to moſt grievous torments in ſoul and body, without intermiſſion, in hell fire for ever, is a doctrine which cannot be reconciled to our natural notions of God. On the other hand, if human nature was not ſomehow debaſed by the fall of our firſt parents, it is not eaſy to account for the numberleſs phraſes in ſcripture which certainly ſeem to ſpeak that language, or for the very general opinion of the Pagan philoſophers and poets reſpecting the golden age and the degeneracy of man. Cicero, in a quotation preſerved

129 The opinions of moderate men among the Calviniſts and Arminians the ſame, and countenanced by general tradition.

Theology from the fall of Adam to the coming of Christ.

preserved by St Auguſtine from a work that is now loſt, has theſe remarkable words, "Homo non ut a matre ſed ut a noverca natura editus eſt in vitam, corpore nudo, et fragili, et infirmo; animo autem anxio ad moleſtias, humili ad timores, molli ad labores, prono ad libidines; in *quo tamen ineſt tanquam obrutus quidam divinus ignis ingenii et mentis* †." Nor do we readily perceive what ſhould induce the more zealous Arminians to oppoſe ſo vehemently this general opinion of the corruption of human nature. Their deſire to vindicate the juſtice and goodneſs of God does them honour; but the doctrine of inherent corruption militates not againſt theſe attributes; for what we have loſt in the firſt Adam has been amply ſupplied to us in the ſecond; and we know from the higheſt authority that the duties required of us are in proportion to our ability, ſince we are told, that "unto whomſoever much is given, of him ſhall much be required."

† Vide D. *Aug.* lib. iv. *contra Pelagium.* Vide etiam *M Tull. Cicer. Con. ſol.*

SECT. IV. *View of Theology from the fall of Adam to the coming of Chriſt.*

WE have dwelt long on the original ſtate of man, his introduction into the terreſtrial paradiſe, the privileges to which he was there admitted, his forfeiture of thoſe privileges, and the ſtate to which he was reduced by tranſgreſſing the law of his Maker; but the importance of theſe events renders them worthy of all the attention that we have paid to them. They paved the way for the coming of Chriſt and the preaching of the goſpel; and unleſs we thoroughly underſtand the origin of the goſpel, we cannot have an adequate conception of its deſign. By contraſting the firſt with the ſecond Adam, St Paul gives us clearly to underſtand, that one purpoſe for which Chriſt came into the world and ſuffered death on the croſs, was to reſtore to mankind that life which they had loſt by the fall of their original progenitor. The preaching of the goſpel therefore commenced with the firſt hint of ſuch a reſtoration; and the promiſe given to Adam and Eve, that "the ſeed of the woman ſhould bruiſe the head of the ſerpent," was as truly evangelical as theſe words of the apoſtle, by which we are taught, that "this is a faithful ſaying and worthy of all acceptation, that Chriſt Jeſus came into the world to ſave ſinners *." The former text taken by itſelf is indeed obſcure, and the latter is explicit; but both belong to the ſame ſyſtem, for the ſcriptures contain but two covenants or diſpenſations of God to man, in which the whole race is included.

* 1 Tim. i. 15.

130 Chriſtianity may be ſaid to have commenced with the fall.

Chriſtianity therefore is indeed very near as old as the creation; but its principles were at firſt obſcurely revealed, and afterwards gradually developed under different forms as mankind became able to receive them, (ſee PROPHECY, N° 5. &c.). All that appears to have been at firſt revealed to Adam and Eve was, that by ſome means or other one of their poſterity ſhould in time redeem the whole race from the curſe of the fall; or if they had a diſtinct view of the means by which that redemption was to be wrought, it was probably communicated to them at the inſtitution of ſacrifices, (ſee SACRIFICE). This promiſe of a future deliverer ſerved to comfort them under their heavy ſentence; and the inſtitution of ſacrifices, whilſt it impreſſed upon their minds lively ideas of the puniſhment due to their tranſgreſſion, was admirably calculated to prepare both them and their poſterity for the great atonement which, in due time, was to take away the ſins of the world.

Theology from the fall of Adam to the coming of Chriſt.

131 Revelations frequent in the early ages of the world;

Our firſt parents, after their fall, were ſo far from being left to fabricate a mode of worſhip for themſelves by thoſe innate powers of the human mind of which we daily hear ſo much, and feel ſo little, that God was graciouſly pleaſed to manifeſt himſelf to their *ſenſes*, and viſibly to conduct them by the angel of his preſence in all the rites and duties of religion. This is evident from the different diſcourſes which he held with Cain, as well as from the complaint of that murderer of being hid from his face, and from its being ſaid, that "he went out from the preſence of the Lord and dwelt on the eaſt of Eden." Nor does it appear that God wholly withdrew his viſible preſence, and left mankind to their own inventions, till their wickedneſs became ſo very great that his ſpirit could no longer ſtrive with them. The infant ſtate of the world ſtood in conſtant need of his ſupernatural guidance and protection. The early inhabitants of this globe cannot be ſuppoſed to have been able, with Moſes *, to look up to him who is *inviſible*, and perform a worſhip purely rational and ſpiritual. They were all tillers of the ground, or keepers of cattle; employed in cultivating and repleniſhing this new world; and, through the curſe brought upon it by their forefather, forced, with him, to eat their bread "in the ſweat of their brow." Man in ſuch circumſtances could have little leiſure for ſpeculation; nor has mere ſpeculation, unleſs furniſhed with principles from another ſource, ever generated in the human mind adequate notions of God's nature or providence, or of the means by which he can be acceptably worſhipped. Frequent manifeſtations, therefore, of his preſence would be neceſſary to keep a tolerable ſenſe of religion among them, and ſecure obedience to the divine inſtitutions; and that the Almighty did not exhibit ſuch manifeſtations, cannot be inferred from the ſilence of that very ſhort hiſtory which we have of thoſe early ages. Adam himſelf continued 930 years a living monument of the juſtice and mercy of God; of his extreme hatred and abhorrence of ſin, as well as of his love and long ſuffering towards the ſinner. He was very ſenſible how ſin had entered into the world, and he could not but appriſe his children of its author. He would at the ſame time inform them of the unity of God, and his dominion over the evil one; of the means by which he had appointed himſelf to be worſhipped; and of his promiſe of future deliverance from the curſe of the fall. Such information would produce a tolerable idea of the Divine Being, and afford ſufficient motives to obey his will. The effects of it accordingly were apparent in the righteous family of Seth, who ſoon diſtinguiſhed themſelves from the poſterity of Cain, and for their eminent piety were honoured with the appellation of *the ſons of God*. Of this family ſprang a perſon ſo remarkable for virtue and devotion, as to be exempted from Adam's ſentence and the common lot of his ſons; for after he had walked with God 300 years, and prophecied to his brethren, he was tranſlated that he ſhould not ſee death. Of this miraculous event there can be no doubt but that his contemporaries had ſome viſible demonſtration; and as the fate of Abel was an argument to their reaſon, ſo the tranſlation of Enoch was a proof to their ſenſes of another ſtate of life after the preſent. To Adam himſelf, if

* Heb. xi. 23.

Theology from the fall of Adam to the coming of Christ.

if he was then alive (s), it must have been a lively and affecting instance of what he might have enjoyed, had he kept his innocence; it must have been a comfortable earnest of the promised victory over the evil one; and have confirmed his hope, that when the head of the serpent should be completely bruised, he and his posterity would be restored to the favour of their Maker, and behold his presence in bliss and immortality.

132 yet vice, and probably idolatry, soon became prevalent.

Notwithstanding this watchful care of God over his fallen creature man, vice, and probably idolatry, spread through the world with a rapid pace. The family of Seth married into that of Cain, and adopted the manners of their new relations. Rapine and violence, unbounded lust and impurity of every kind, prevailed universally; and when those giants in wickedness had filled the earth with tyranny, injustice, and oppression; when the whole race was become entirely carnal—God, after raising up another prophet to give them frequent warnings of their fate for the space of 120 years, was at length obliged, in mercy to themselves as well as to the succeeding generations of men, to cut them off by a general deluge. See DELUGE.

133 Pure religion for some time after the flood;

Thus did God, by the spirit of prophecy, by frequent manifestations of his own presence; and by uninterrupted tradition—make ample provision for the instruction and improvement of the world for the first 1600 years. After the deluge he was pleased to converse again with Noah, and make in his person a new and extensive covenant with mankind, (see PROPHECY, N° 11.). Of his power, justice, and goodness; of his supreme dominion over the earth and the heavens; of his abhorrence of sin, and his determination not to let it go unpunished—that patriarch and his family had been most awfully convinced; nor could they or their children, for some time, want any other argument to enforce obedience, fear, and worship. The sons of Noah were an hundred years old when the deluge overwhelmed the earth. They had long conversed with their ancestors of the old world, had frequented the religious assemblies, observed every Sabbath day, and been instructed by those who had seen Adam. It is therefore impossible that they could be ignorant of the creation of the world, of the fall of man, or of the promise of future deliverance from the consequences of that fall; or that they could offer their sacrifices, and perform the other rites of the instituted worship, without looking forward with the eye of faith to that deliverance seen, perhaps obscurely, through their typical oblations.

134 Idolatry, however, the cause of the dispersion from Babel.

In this state of things religion might for some time be safely propagated by tradition. But when by degrees mankind corrupted that tradition in its most essential parts; when, instead of the one Supreme God, they set up several orders of inferior deities, and worshipped all the host of heaven; when, at the same time they were uniting under one head, and forming a universal empire under the patronage of the Sun their chief divinity (see BABEL)—God saw it necessary to disperse them into distinct colonies, by causing such discord among them as rendered it impossible for any one species of idolatry to be at once universally established.

After this dispersion, there is reason to believe that particular revelations were vouchsafed wherever men were disposed to regard them. Peleg had his name prophetically given him from the dispersion which was to happen in his days; and not only his father Eber, but all the heads of families mentioned from Noah to Abraham, are with much plausibility supposed to have had the spirit of prophecy on many occasions. Noah was undoubtedly both priest and prophet; and living till within two years of the birth of Abraham, or, according to others, till that patriarch was near 60 years old, he would surely be able to keep up a tolerable sense of true religion among such of his descendants as sojourned within the influence of his doctrine and example. His religious son Shem, who lived till after the birth of Isaac, could not but preserve in tolerable purity the faith and worship of the true God among such of his own descendants as lived in his neighbourhood.

But though the remains of true religion were thus preserved among a few righteous men, idolatry had in a short time prevailed so far among the sons of Noah, that God, saw it expedient not only to shorten the lives of men, but also to withdraw his presence from the generality, who had thus rendered themselves unworthy of such communications; and to select a particular family, in which his worship might be preserved pure amidst the various corruptions that were overspreading the world. With this view Abraham was called, and, after many remarkable trials of his faith and constancy, admitted to a particular intimacy and friendship with his Maker. God entered into a peculiar covenant with him, engaging to be his present guide, protector, and defender; to bestow all temporal blessings upon him and his seed; and to make some of those seed the instruments of conveying blessings of a higher kind to all the nations of the earth.

135 The call of Abraham was

136 to prevent the universal spreading of idolatry.

It was doubtless for his singular piety that Abraham was fixed upon to be the parent of that people, who should preserve the knowledge of the unity of God in the midst of an idolatrous and polytheistic world; but we are not to imagine that it was for his sake only that all this was done, or that his less worthy descendants were by the equal Lord of all treated with partial fondness for the virtues of their ancestor; it was for the benefit of mankind in general that he was called from his country, and from his father's house, that he might preserve the doctrine of the divine unity in his own family, and be an instrument in the hand of Providence (and a fit one he was) to convey the same faith to the nations around him. Accordingly, we find him distinguished among the neighbouring princes, and kings reproved for his sake; who being made acquainted with his prophetic character, desired his intercession with God. History tells us of his conversing on the subject of religion with the most learned Egyptians, who appear to have derived from him or some of his descendants the rite of circumcision, and to have been for a while stopt in the progress towards the last stage of that degrading idolatry which afterwards rendered their national worship the opprobrium of the whole earth, (see POLYTHEISM, N° 28). We are informed that his name was held in the greatest veneration all over the East; that the Magians, Sabians, Persians,

(s) According to the Samaritan chronology, he was alive; according to the Hebrew, he had been dead 57 years.

Theology from the fall of Adam to the coming of Christ.

Perſians, and Indians, all glory in him as the greateſt reformer of their reſpective religions: and to us it appears extremely probable, that not only the Brachmans, but likewiſe the Hindoo god Brahma *, derive their names from the father of the faithful. As he was let into the various counſels of the Almighty, and taught to reaſon and reflect upon them; as he was fully appriſed of the overthrow of Sodom and Gomorrah, with the particular circumſtances of that miraculous event; and as he had frequent revelations of the promiſed Redeemer, whoſe day he longed earneſtly to ſee, and ſeeing it was glad—there can be no doubt but that he and his family took care to propagate theſe important doctrines in every nation which they viſited; for the only reaſon which we can conceive for his being made to wander from place to place was, that different people might be induced to inquire after his profeſſion, his religion, and his hopes.

* See *Aſiatic Reſearches and Newt. Chron.*

But though the Supreme Being was pleaſed to manifeſt himſelf in a more frequent and familiar manner to Abraham, he by no means left the reſt of the world without ſufficient light. Lot profeſſed the true religion in the midſt of Sodom. In Canaan we meet with Melchizedeck, king and prieſt of the moſt high God, who bleſſed Abraham, and to whom that patriarch himſelf did homage. Abimelech king of Gerar receiving an admonition from the Lord, immediately paid a due regard to it; and the ſame ſenſe of religion and virtue deſcended to his ſon. Laban and Bethuel acknowledged the Lord, and the former of them was even favoured with a viſion. In Arabia, we find Job and his three friends, all men of high rank, entering into the deepeſt diſquiſitions in theology; agreeing about the unity, omnipotence, and ſpirituality of God; the juſtice of his providence, with other fundamental articles of true religion; and mentioning divine inſpiration or revelation as a thing not uncommon in their age and country * (U). Balaam appears to have been a true prophet; and as he was unqueſtionably a man of bad morals, the natural inference is, that the gift of prophecy was then, as afterwards beſtowed on individuals, not for their own ſakes, but for the ſake of the public; and that, as in "every nation, he who feareth God and worketh righteouſneſs is accepted of him;" ſo in thoſe early ages of the world, when mankind were but children in religious knowledge, they were bleſſed with the light of divine revelation wherever they were diſpoſed to make a proper uſe of it.

137 Occaſional revelations given to other pious men.

* Job. iv. 12, 15, 16, 17. vi. 10. xxiii. 12.

Very few, however, appear to have had this diſpoſition; and therefore God was pleaſed to adopt Abraham and part of his poſterity as the race from which the great Redeemer was to ſpring, to train them up by degrees in ſuitable notions of their Creator, and gradually to open up to them, as they were able to receive it, the nature of that diſpenſation under which "all the nations of the earth were to be bleſſed in the patriarch's ſeed, (ſee PROPHECY, N° 13). For this purpoſe, he held frequent correſpondence with them; and to ſtrengthen and confirm their faith, to fix and preſerve their dependence on the one God of heaven and earth, he daily gave them new promiſes, each more magnificent than that which preceded it. He bleſſed Iſaac, miraculouſly increaſed his ſubſtance, and ſoon made him the envy of the neighbouring princes. He foretold the condition of his two ſons, renewed the promiſe made to Abraham, and bleſſed the adopted ſon Jacob, with whom he condeſcended to converſe as he had converſed with Abraham and Iſaac; renewing to him the great promiſe; beſtowing upon him all kinds of riches; and impreſſing ſuch terror upon all the cities which were round about him as prevented them from hurting either him or his family.

138 A ſecond purpoſe for which Abraham was called.

All this was indeed little enough to keep alive even in the mind of Jacob a tolerable ſenſe of duty and dependence on his Creator. After the firſt viſion he is ſurpriſed, and heſitates, ſeemingly inclined to make a kind of ſtipulation with his Maker. "If (ſays he) God will be with me, and will keep me in this way that I go, and will give me bread to eat, and raiment to put on, ſo that I come again to my father's houſe in peace, *then* ſhall the Lord be my God †." It appears not to have been till after many ſuch revelations, bleſſings, and deliverances, and being reminded of the vow which on this occaſion he had vowed, that he ſet himſelf in good earneſt to reform the religion of his own family, and to drive out from it all ſtrange gods *. So little able, in that age, were the boaſted powers of the human mind to preſerve in the world juſt notions of the unity of the Godhead, that we ſee there was a neceſſity for very frequent revelations, to prevent even the beſt men from running headlong into polytheiſm and idolatry.

† Gen. xxviii. 20, 21.

* Gen. xxxv. 2.

Thus was God obliged to treat even with the patriarchs themſelves, by way of poſitive covenant and expreſs compact; to promiſe to be their God if they would be his people; to give them a portion of temporal bleſſings as introductory to future and ſpiritual ones; and to engage them in his ſervice by immediate rewards, till they could be led on to higher views, and prepared by the bringing in of a better hope to worſhip him in ſpirit and in truth. With regard to what may be called the *theory* of religion, mankind were yet ſcarcely got out of their childhood. Some extraordinary perſons indeed occaſionally appeared in different countries, ſuch as Enoch, Noah, Abraham, and Job, with many others, who had a more enlarged proſpect of things, and entertained more worthy ſentiments of the divine diſpenſations and of the ultimate end of man; but theſe were far ſuperior to the times in which they lived, and appear to have been providentially raiſed up to prevent the ſavage ſtate and ſavage idolatry from becoming univerſal among men. See SAVAGE.

139 The patriarchal worſhip of thoſe early ages performed in faith

The worſhip which was practiſed by thoſe holy men appears to have conſiſted principally of the three kinds of ſacrifice mentioned elſewhere (ſee SACRIFICE); to which were doubtleſs added prayers and praiſes, with the

(U) There are great diſputes among the learned reſpecting the antiquity and the author of the *book* of Job, and whether it be a hiſtory of events, or a poem which has its foundation in hiſtory. All ſober men, however, are agreed, that there really was ſuch a *perſon* as Job, eminent for patience under uncommon ſufferings; and that he was of very remote antiquity. The LXX. give us the names of his father and mother, and ſay that he was the fifth from Abraham.

Theology from the fall of Adam to the coming of Christ.

the more valuable oblation of pure hands and devout hearts. Such of them as looked forward to a future redemption, and had any tolerable notion of the means by which it was to be effected, as Abraham certainly had, must have been sensible that the blood of bulls and of goats could never take away sin, and that their sacrifices were therefore valuable only when they were offered in faith of that great promise, "which they, having seen it afar off, were persuaded of, and embraced: and confessed that they were strangers and pilgrims upon earth."

140 of a future Redeemer.

That such persons looked for "a better country, even a heavenly one," in a future state cannot be questioned; for they knew well how sin and death had entered into the world, and they must have understood the promise made to their original progenitor, and repeatedly renewed to themselves, to include in it a deliverance at some period from every consequence of the first transgression. They were to all intents and purposes Christians as well as we. They indeed placed their confidence in a Redeemer, who in the fulness of time was to appear upon earth, while we place ours in a Redeemer that has been already manifested; they expressed that confidence by one mode of worship, we express it by another; but the patriarchal worship had the same end in view with the Christian—the attainment of everlasting life in heaven.

141 Such faith however, not general.

The generality of men, however, appear not, in the early age of which we now write, to have extended their views beyond the present life. From the confused remains of ancient tradition, they acknowledged indeed some superior power or powers, to whom they frequently applied for direction in their affairs; but in all probability it was only for direction in temporal affairs, such as the cultivation of the ground, or their transactions with each other. In the then state of things, when no part of the world was overstocked with inhabitants, and when luxury with its consequences were everywhere unknown, virtue and vice must have produced their natural effects; and the good man being happy here, and the wicked man miserable, reason had no data from which to infer the reality of a future state of rewards and punishments. Those who were blessed with the light of revelation undoubtedly looked forward to that state with a holy joy; but the rest worshipped superior powers from worldly motives. How many of those powers there might be, or how far their influence might reach, they knew not. Uncertain whether there be one Supreme Governor of the whole world, or many co-ordinate powers presiding each over a particular country, climate, or place—gods of the hills and of the valleys, as they were afterwards distinguished—they thought that the more of these they could engage in their interest the better. Like the Samaritans therefore, in after times, they sought, wherever they came, the "the manners of the god of the land," and served him, together with their own gods.

142 The purpose for which the Israelites were made to sojourn in Egypt.

Thus was the world ready to lose all knowledge of the true God and his worship, had not he been graciously pleased to interpose, and take effectual care to preserve that knowledge in one nation, from which it might be conveyed to the rest of mankind at different times, and in greater or less degrees, as they should be capable of receiving it. To this purpose he made way for the removal of Jacob and his family to one of the most improved and polished countries of the world; and introduced them into it in a manner so advantageous, as to give them an opportunity of imparting much religious knowledge to the natives. The natives, however, were gross idolaters; and that his chosen people might be as far as possible from the contagion of their example, he placed them upon the borders of Egypt, where, though they multiplied exceedingly, they were by their very occupation † still kept a separate people, and must have been rendered, by a long and severe oppression, in a great degree averse to the manners and religion of their neighbours. This aversion, however, seems to have gradually becomes less and less; and before they were miraculously redeemed from their house of bondage, they had certainly lost all correct notions of the unity of God, and the nature of his worship, and had adopted the greater part of the superstitions of their task-masters. Of this we need no other proof than what is implied in the words of Moses ‡, when he said unto God, "Behold, when I come unto the children of Israel, and say unto them, the God of your fathers hath sent me unto you; and they shall say unto me, WHAT IS HIS NAME? what shall I say unto them?" Had not the destined lawgiver of the Hebrews been aware that his countrymen had adopted a plurality of gods, this difficulty could not have occurred to him; for *names* are never thought of but to distinguish from each other beings of the same kind; and he must have remembered, that in Egypt, where the multitude of gods was marshalled into various classes, the knowledge of their names was deemed of great importance. This we learn likewise from Herodotus, who informs us *, that the Pelasgi, after settling in Greece, thought it necessary to consult the oracle of Dodona, whether it would be proper to give to their own gods the names of the Egyptian divinities? and that the oracle, as might have been supposed, assured them that it would. Indeed the Hebrews during their residence in Egypt had acquired such an attachment to the idolatrous worship of the country, that it appears never to have left them entirely till many ages afterwards, when they were carried captive into Babylon, and severely punished for their repeated apostacies; and so completely were they infatuated by these superstitions at the era of their exodus, that, as the prophet Ezekiel informs us §, they rebelled against God, and would not cast away their abominations, or forsake the idols of Egypt, even in the *very day* that the hand of Omnipotence was lifted up to bring them forth of that land in which they had been so long and so cruelly oppressed. In such a state of things, to have suffered them to remain longer in Egypt, could have served no good purpose; and therefore to fulfil the promise which he had given to Abraham, God determined to deliver them out of the hand of the Egyptians by means which should convince both them and their offspring of his own supremacy over heaven and earth.

† Gen. xlvi. 33, 34.

‡ Exod. iii.

143 Consequences of it.

* Lib. ii. cap. 52, 53.

§ Ch. xx.

144 Moses appointed to bring them out of Egypt.

As Moses was the person appointed to deliver God's message to Pharaoh, and to demand of him leave for the Israelites to go three days journey into the wilderness to serve the God of their fathers, it was necessary that he should be endowed with the power of working miracles to evince the reality of his divine mission. Without a conviction that his claims were well-founded, neither Pharaoh nor his own countrymen could reasonably have been expected to listen to the proposals of a man who, though blessed in his youth with a princely education, had come directly on his embassy from the humble employment

Theology from the fall of Adam to the coming of Christ.

ployment of a shepherd, which he had for many years exercised in the country of Midian. To prove that he was really sent by God, any visible and undoubted controul of the laws of nature would have been abundantly sufficient; but he was to prove not only this truth, but also the unity of the Divine nature; and the miracles which he was directed to work were executions of judgements against the very gods of Egypt †.

† Exod. xii. 12.

When Pharaoh first turned a deaf ear to his request, though enforced by the conversion of a rod into a serpent, at the command of Jehovah he smote with the same rod upon the waters in the river, which were instantly converted into blood, and occasioned the death of all the fishes that swam in them. To any people this miracle would have been a proof of Divine agency; but it was in a particular manner calculated to open the eyes of the blind and infatuated Egyptians, who considered the Nile as one of their greatest gods, and all the fishes that it contained as subordinate divinities. They called that noble river sometimes *Sirius*, sometimes *Osiris*, sometimes *Canobus* (see CANOBUS), and not unfrequently Ωκεανης (x); and adored it as the parent of all their deities. What then must the people have thought when they found their most revered god, at the command of a servant of Jehovah, converted into blood, and all his sacred offspring into stinking carcases? To conceive their consternation, if it can be conceived, the reader must remember, that the Egyptian priests held blood in the utmost abhorrence, as a thing of which the very touch would deeply pollute them, and require immediate and solemn expiation. The same sacred river was a second time polluted, when it sent forth frogs, which covered all the land of Egypt, and died in the houses, in the villages, and in the fields; thus rendering it impossible for the people to avoid the touch of dead bodies, though from every such contact they believed themselves to contract an impurity, which, in the case before us, must have been the more grievous, that in the whole country there was not left a pool of uninfected water to wash away the stain.

145 The propriety of the miracles which he wrought

The third plague inflicted on the Egyptians was. the converting of the dust of the land into lice, upon man and upon beast, throughout the whole kingdom. To see the propriety of this miracle as a judgement upon their idolatry, we must recollect their utter abhorrence of all kinds of vermin, and their extreme attention to external purity above every other people perhaps that has hitherto existed on the face of the earth. On this head they were more particularly solicitous when about to enter the temples of their gods; for Herodotus informs us, that their priests wore linen raiment only, and shaved off every hair from their heads and bodies, that there might be no *louse* or other detestable object upon them when performing their duty to the gods. This plague therefore, while it lasted, made it impossible for them to perform their idolatrous worship, without giving such offence to their deities as they imagined could never be forgiven. Hence we find, that on the production of the lice, the priests and magicians perceived immediately from what hand the miracle had come, and exclaimed, "This is the finger of God!" The fourth plague seems to have been likewise acknowledged to be the finger of God, if not by the magicians, at least by Pharaoh; for in a fit of terror he agreed that the Israelites should go and serve the Lord. That he was terrified at the swarms of flies which infested the whole country, except the land of Goshen, will excite no wonder, when it is known that the worship of the fly originated in Egypt; whence it was carried by the Caphtorim to Palestine; by the Phœnicians to Sidon, Tyre, and Babylon; and from these regions to other parts of the world. The denunciation of this plague was delivered to Pharaoh early in the morning, when he was on the banks of the Nile, probably paying his accustomed devotion to his greatest god; and when he found himself and his people tormented by a swarm of subordinate divinities, who executed the judgement of Jehovah in defiance of the power of the supreme *numen* of Egypt, he must have been convinced, had any candour remained in his mind, that the whole system of his superstition was a mass of absurdities, and that his gods were only humble instruments at the disposal of a Superior Power. He was not, however, convinced; he was only alarmed, and quickly relapsed into his wonted obstinacy. The fifth plague therefore, the murrain among the cattle, brought death and destruction on his most revered gods themselves. Neither Osiris, nor Isis, nor Ammon, nor Pan, had power to save his brute representatives. The sacred bull, and heifer, and ram, and goat, were carried off by the same malady which swept away all the other herds of deities, these *dii stercorei*, who lived on grass and hay. The impression of this punishment must have been awful on the minds of the Egyptians, but perhaps not equal to that which succeeded it.

146 to evidence the vanity of idol worship.

In Egypt there were several altars on which human sacrifices were offered; and from the description of the persons qualified to be victims, it appears that those unhappy beings must have been foreigners, as they were required to have bright hair and a particular complexion. The hair of the Israelites was much brighter than that of the Egyptians, and their complexions fairer; and therefore there can be little doubt but that, during their residence in Egypt, they were made to furnish the victims demanded by the bloody gods. These victims being burnt alive on a high altar, and thus sacrificed for the good of the nation, their ashes were gathered together by the priests, and scattered upwards in the air, that a blessing might be entailed on every place to which an atom of this dust should be wafted. Moses too, by the direction of the true God, took ashes of the furnace, probably of one of those very furnaces in which some of his countrymen had been burnt, and sprinkling them towards heaven in the sight of Pharaoh, brought boils and blains upon all the people, of so malignant a nature, that the magicians and the other ministers of the medical gods, with which Egypt abounded beyond all other countries, could not themselves escape the infection.

The powers of darkness were thus foiled; but the heart of the monarch was still hardened. Destruction was therefore next brought on him and his country by the elements, which were among the earliest idol deities not

(x) Whence came the Greek word ωκεανος, *the ocean*.

not only of the Egyptians, but of every other polytheistic nation. "The Lord rained hail on the land of Egypt; so that there was hail, and fire mingled with the hail, such as there was none like it in all the land Egypt since it became a nation. And the hail smote throughout all the land of Egypt all that was in the field, both man and beast; and the hail smote every herb of the field, and broke every tree of the field." This was a dreadful calamity in itself; and the horror which it excited in the minds of the people must have been greated aggravated by the well-known fact, that Egypt is blessed with a sky uncommonly serene; that in the greatest part of it rain has never been seen at any other time since the creation of the world; and that a slight and transient shower is the utmost that in the ordinary course of nature falls anywhere throughout the country. The small quantity of vegetables which was left undestroyed by the fire and the hail was afterwards devoured by locusts, which by a strong east wind were brought in such numbers from Arabia, where they abounded at all times, that they covered the whole face of the earth, and did eat every herb of the land, and all the fruit of the trees, so that there remained not any green thing in the trees or in the herbs of the field through all the land of Egypt.

The ninth plague which the obstinacy of Pharaoh brought upon his country, whilst it severely punished the Egyptians for their cruelty to the Hebrews, struck at the very foundation of all idolatry. We have elsewhere shown, that the first objects of idolatrous worship were the contending powers of light and darkness (see POLYTHEISM; and that the benevolent principle, or the power of light, was everywhere believed to maintain a constant superiority over the power of darkness. Such was the faith of the ancient Persians; and such, as a very learned writer has lately proved, was likewise the faith of the earlier Egyptians. It was therefore with wisdom truly divine, that God, to show the vanity of their imaginations, brought upon those votaries of light, who fancied themselves the offspring of the sun, a preternatural darkness, which, for three days, all the powers of their supreme deity, and his subordinate agents, could not dispel.

The tenth and last plague brought on this idolatrous people was more universally and severely felt than any which had preceded it. It was likewise, in some sense, an instance of the *lex talionis*, which requires an eye for an eye, and a tooth for a tooth, &c. Moses was commanded, at his first interview with Pharaoh, to say, "Thus saith the Lord, Israel is my son, even my first-born. Let my son go that he may serve me: and if thou refuse to let him go, behold, I will slay thy son, even thy first-born." Before this threat was put in execution, every attempt was made to soften the hardened heart of the obstinate tyrant. The waters of his sacred river were turned into blood, and all the fishes that it contained slain; frogs were brought over all the land to pollute the people; the ministers of religion were rendered so impure by vermin, that they could not discharge their wonted offices; the animals most revered as gods, or emblems of gods, were cut off by a murrain; the elements, that were everywhere worshipped as divinities, carried through the land a devastation, which was completed by swarms of locusts; the ashes from the sacred furnace, which were thought to convey blessings whithersoever they were wafted, were made to communicate incurable diseases; a thick and preternatural darkness was spread over the kingdom, in defiance of the power of the great Osiris; and when the hearts of the people and their sovereign continued still obdurate, the eldest son in each family was slain, because they refused to let go Israel, God's first-born. From this universal pestilence the Israelites were preserved by sprinkling the door-posts of their houses with the blood of one of the animals adored in Egypt; a fact which, as it could not be unknown to Pharaoh or his subjects, ought to have convinced that people of the extreme absurdity of their impious superstitions. This effect it seems not to have had; but the death of the first-born produced the deliverance of the Hebrews; for when it was found that there was not a house where there was not one dead, "Pharaoh called for Moses and Aaron by night, and said, Rise up, and get you forth from among my people, both you and the children of Israel; and bless me also. And the Egyptians were urgent upon the people, that they might send them out of the land in haste; for they said, We be all dead men (Y)." The wonted obstinacy of the monarch indeed very soon returned; and his subjects, forgetting the loss of their children, joined with him in a vain attempt to bring back to bondage the very people whom they had been thus urgent to send out of the land; but their attempt was defeated by Jehovah, and all who engaged in it drowned in the Red sea.

The God of Israel having thus magnified himself over the Egyptians and their gods, and rescued his people from bondage by such means as must not only have struck terror and astonishment into the whole land, but also have spread his name through all the countries which had any communication with that far-famed nation, proceeded to instruct and exercise the Hebrews for many years in the wilderness. He inculcated upon them the unity of the Godhead; gave them statutes and judgements more righteous than those of any other nation; and by every method consistent with the freedom of moral agency guarded them against the contagion of idolatry and polytheism. He sent his angel before them to keep them in the way, took upon himself the office of their supreme civil governor, and by his presence directed them in all their undertakings. He led them with repeated signs and wonders through the neighbouring nations, continued to try and discipline them

147 Reason of detaining the Israelites so long in the wilderness.

(Y) For this account of the plagues of Egypt, we are indebted to the very valuable *Observations* on the subject published by *Mr Bryant*. We have not quoted the authorities by which the learned and pious author supports his opinions; because it is to be hoped, that for a fuller account of these important transactions the reader will have recourse to his work, of which we have given only a very brief abstract. For much of the preceding parts of this section, we acknowledge our obligations to Bishop Law's admirable discourse on the *Several Dispensations of Revealed Religion*.

Theology from the fall of Adam to the coming of Christ.

them till they were tolerably attached to his government and eſtabliſhed in his worſhip, and introduced them into the Promiſed Land when its inhabitants were ripe for deſtruction. At their entrance into it, he gave them a ſummary repetition of their former laws, with more ſuch ordinances, doth of a ceremonial and moral kind, as were both ſuited to their temper and circumſtances, as well as to prefigure, and by degrees to prepare them for, a more perfect diſpenſation under the Meſſiah.

148 Great objects of the Jewiſh law.

The Jewiſh law had two great objects in view; of which the firſt was to preſerve among them the knowledge of the true God, a rational worſhip ſpringing from that knowledge, and the regular practice of moral virtue: and the ſecond was to fit them for receiving the accompliſhment of the great promiſe made to their anceſtors, by means analogous to thoſe which a ſchoolmaſter employs to fit his pupils for diſcharging the duties of maturer years. Every thing in that law peculiar to itſelf, its various ceremonies, modes of ſacrificing, the ſanctions by which it was enforced, and the theocratic government by which it was adminiſtered, had a direct tendency to promote one or other of theſe ends; and keeping theſe ends in view, even the minuteſt laws, at which impious ignorance has affected to make itſelf merry, will be diſcovered by thoſe who ſhall ſtudy the whole ſyſtem, and are at the ſame time acquainted with the genius of ancient polytheiſm, to have been enacted with the moſt conſummate wiſdom.

It is not eaſy for us, who have been long bleſſed with the light of revelation, to conceive the propenſity of all nations, in that early age of the world, to the worſhip of falſe gods, of which they were daily adding to the number. It is indeed probable, from many paſſages of Scripture, as well as from profane authors of the greateſt antiquity, that one ſupreme *numen* was everywhere acknowledged: but he was conſidered as an extramundane being, too highly exalted to concern himſelf with the affairs of this world, the government of which, it was believed, he had delegated to various orders of ſubordinate deities. Of thoſe deities, ſome were ſuppoſed to have the charge of one nation and ſome of another. Hence it is, that we read of the gods of Egypt, the gods of the Ammorites, and the gods of the different nations around Paleſtine. None of thoſe nations denied the exiſtence of their neighbour's gods; but all agreed, that while the Egyptians were the peculiar care of Oſiris and Iſis, the Amorites might be the favourites of Moloch, the Phœnicians of Cronus, and the Philiſtines of Dagon; and they had no objection occaſionally to join with each other in the worſhip of their reſpective tutelary deities. Nay, it was thought impiety in foreigners, while they ſojourned in a ſtrange country, not to ſacrifice to the gods of the place. Thus Sophocles makes Antigone ſay to her father, that a ſtranger ſhould both venerate and abhor thoſe things which are venerated and abhorred in the city where he reſides; and another author *, who, though comparatively late, drew much of his information from ancient writings, which are now loſt, aſſures us, that this complaiſance proceeded from the belief that the "ſeveral parts of the world were from the beginning diſtributed to ſeveral powers, of which each had his peculiar allotment and reſidence."

Theology from the fall of Adam to the coming of Christ.

* *Celſus apud Aug.*

From this notion of local divinities, whoſe power or partial fondneſs was confined to one people, the Iſraelites, on their departure from Egypt, appear not to have been free (z). Hence it is, that when the true God firſt tells them, by their leader Moſes †, that if they would obey his voice indeed and keep his covenant, then they ſhould be a PECULIAR TREASURE to him above all people: to prevent them from ſuppoſing that he ſhared the earth with the idols of the heathen, and had from partial fondneſs choſen them for his *portion*, he immediately adds, for ALL THE EARTH IS MINE. By this addition he gave them plainly to underſtand that they were choſen to be his peculiar treaſure for ſome purpoſe of general importance; and the very firſt article of the covenant which they were to keep was, that they ſhould have no other gods but him. So inveterate, however, was the principle which led to an intercommunity of the objects of worſhip, that they could not have kept this article of the covenant but in a ſtate of ſeparation from the reſt of mankind ‡; and that ſeparation could neither have been effected nor continued without the viſible providence of the Almighty watching over them as his peculiar treaſure. This we learn from Moſes himſelf, who, when interceding for the people after their idolatrous worſhip of the golden calf, and intreating that the preſence of God would ſtill accompany them, adds theſe words §: "For wherein ſhall it be known here that I and thy people have found grace in thy ſight? Is it not in that THOU GOEST WITH US? So ſhall we be SEPARATED, I and thy people, from all the people that are on the face of the earth." On this ſeparation every thing depended; and therefore to render it the more ſecure, Jehovah was graciouſly pleaſed to become likewiſe their ſupreme Magiſtrate, making them a "kingdom of prieſts and a holy nation," and delivering to them a digeſt as well of their civil as of their religious laws.

† Exod. xix. 5.

149 Purpoſe of their ſeparation from other people,

‡ 1 Sam. xxvi. 19.

§ Exod. xxxiii. 16.

150 of their theocratic government,

The Almighty thus becoming their King, the government of the Iſraelites was properly a THEOCRACY, in which the two ſocieties, civil and religious, were of courſe incorporated. They had indeed after their ſettlement in the Promiſed Land, at firſt, temporary *judges* occaſionally raiſed up; and afterwards permanent magiſtrates called *kings*, to lead their armies in war, and to give vigour to the adminiſtration of juſtice in peace: but neither thoſe judges nor thoſe kings could abrogate a ſingle law of the original code, or make the ſmalleſt addition to it but by the ſpirit of prophecy. They cannot

(z) It is not indeed evident that they had got entirely quit of this abſurd opinion at a much later period. Jephtha, one of their judges, who, though half paganized (as Warburton obſerves) by a bad education, had probably as correct notions of religion as an ordinary Iſraelite, certainly talked to the king of Ammon as if he had believed the different nations of the earth to be under the immediate protection of different deities: "Wilt not thou (ſays he) poſſeſs that which Chemoſh THY GOD giveth thee to poſſeſs! So whomſoever the Lord OUR GOD ſhall drive out from before us, them will we poſſeſs. (Judges xi. 24.).

Theology from the fall of Adam to the coming of Christ.

not therefore be considered as supreme magistrates, by whatever title they may have been known; for they were to go out and come in at the word of the priests, who were to ask counsel for them of the Lord, and with whom they were even associated in all judicial proceedings, as well of a civil as of a spiritual nature *. Under any other than a theocratic government the Hebrews could not have been kept separate from the nations around them; or if they could, that separation would not have answered the great purpose for which it was established. "The people, on their leaving Egypt, were sunk into the lowest practices of idolatry. To recover them by the discipline of a separation, it was necessary that the idea of God and his attributes should be impressed upon them in the most *sensible* manner. But this could not be commodiously done under his character of God of the universe: under his character of King of Israel, it well might. Hence it is, that we find him in the Old Testament so frequently represented with affections analogous to human passions. The civil relation in which he stood to the Israelites made such a representation natural; the grossness of their conceptions made the representation necessary; and the guarded manner in which it was always qualified prevented it from being mischievous †," Hence too it is, that under the Mosaic dispensation, idolatry was a crime of state, punishable by the civil magistrate. It was indeed high treason, against which laws were enacted on the justest principles, and carried into effect without danger of error. Nothing less indeed than penal laws of the severest kind could have restrained the violent propensity of that headstrong people to worship, together with their own God, the gods of the Heathen. But penal laws enacted by human authority for errors in religion are manifestly unjust; and therefore a theocratic government seems to have been absolutely necessary to obtain the end for which the Israelites were separated from the surrounding nations.

* Num. xxvii. 21. and Deut. xvii. 8—13.

† *Warburton's Div. Leg.* book v. sect. 2.

151 and of the ritual law,

It was for the same purpose that the ritual law was given, after their presumptuous rebellions in the wilderness. Before the business of the golden calf, and their frequent attempts to return into Egypt, it seems not to have been the Divine intention to lay on them a yoke of ordinances; but to make his covenant depend entirely on their duly practising the rite of circumcision; observing the festivals instituted in commemoration of their deliverance from bondage, and other signal services vouchsafed them; and keeping inviolate all the precepts of the decalogue (A), which, if they had done, they should have even lived in them ‡. But after their repeated apostacies, and impious wishes to mix with the surrounding nations, it was necessary to subject them to a multifarious ritual, of which the ceremonial parts were solemn and splendid, fitted to engage and fix the attention of a people whose hearts were gross; to inspire them with reverence, and to withdraw their affections from the pageantry of those idle superstitions which they had so long witnessed in the land of Egypt.

‡ *Divine Leg.* book iv. sect. 6.

To keep them warmly attached to their public worship, that worship was loaded with operose and magnificent rites, and so completely incorporated with their civil polity as to make the same things at once duties of religion and acts of state. The service of God was indeed so ordered as to be the constant business as well as entertainment of their lives, supplying the place of all other entertainments; and the sacrifices which they were commanded to offer on the most solemn occasions, were of such animals as the Egyptians and other Heathens deemed sacred.

152 instanced in their sacrifices,

Thus a heifer without blemish was in Egypt held sacred to the goddess Isis, and worshipped as the representative of that divinity; but the same kind of heifer was by the ritual law of the Hebrews commanded to be burnt without the camp, as the vilest animal, and the water of separation to be prepared from her ashes *. The goat was by the Egyptians held in great veneration as emblematical of their ancient god Pan, and sacrifices of the most abominable kind were offered to the impure animal (see PAN); but God, by his servant Moses, enjoined the Israelites to offer goats themselves as sacrifices for sin, and on one occasion to dismiss the live animal loaded with maledictions into the wilderness †. The Egyptians, with singular zeal, worshipped a calf without blemish as the symbol of Apis, or the god of fertility; and it appears from the book of Exodus, that the Israelites themselves had been infected with that superstition. They were, however, so far from being permitted by their Divine lawgiver to consider that animal as sacred, that their priests were commanded to offer for themselves a young calf as a sin-offering ‡. No animal was in Egypt held in greater veneration than the ram, the symbol of their god Ammon, one of the constellations. It was therefore with wisdom truly divine, that Jehovah, at the institution of the passover, ordered his people to kill and eat a young ram on the very day that the Egyptians began their annual solemnities § in honour of that animal as one of their greatest gods; and that he enjoined the blood of this divinity to be sprinkled as a sign on the two side-posts and upper door-post of the house in which he was eaten. Surely it is not in the power of imagination to conceive a ritual better calculated to cure the Israelites of their propensity to idol worship, or to keep them separate from the people who had first given them that propensity, than one which enjoined them to offer in sacrifice the very creatures which their superstitious masters had worshipped as gods. "Shall we (said Moses) sacrifice the abominations of the Egyptians before their eyes, and will they not stone us?"

* Num. xix.

† Levit. xvi.

‡ Levit. ix.

§ *Spencer de Legibus, Heb. Rit.* lib. ii. cap. iv.

But it was not against Egyptian idolatry only that the ritual law was framed: the nations of Syria, in the midst of whom the Israelites were to dwell, were addicted to many cruel and absurd superstitions, against which it was as necessary to guard the people of God as against the brute-worship of Egypt. We need not inform any reader of the book of Moses that those nations worship-

ped

(A) Of these precepts we think it not necessary, in an abstract so short as this, to waste the reader's time with a formal and laboured defence. To the decalogue no objection can be made by any man who admits the obligations of natural religion; for, except the observation of the Sabbath-day, it enjoins not a single duty which does not by the confession of all men result from our relations to God, ourselves, and our fellow-creatures.

Theology from the fall of Adam to the coming of Christ.

ped the sun and moon and all the host of heaven; or that it was part of their religion to propitiate their offended gods by occasionally sacrificing their sons and their daughters. From such worship and sacrifices the Israelites were prohibited under the severest penalties; but we cannot consider that prohibition as making part of the *ritual* law, since it relates to practices impious and immoral in themselves, and therefore declared to be abominations to the Lord. The Phœnicians, however, and the Canaanites, entertained an opinion that every child came into the world with a *polluted nature*, and that this pollution could be removed only by a *lustral fire*. Hence they took their new-born infants, and with particular ceremonies made them pass through the flame of a pile sacred to Baal or Moloch, the symbols of their great god the sun. Sometimes this purgation was delayed till the children had arrived at their tenth or twelfth year, when they were made either to leap through the flame, or run several times backwards and forwards between two contiguous sacred fires; and this lustration was supposed to free them from every natural pollution, and to make them through life the peculiar care of the deity in whose honour it was performed *. The true God, however, who would have no fellowship with idols, forbade all such purgations among his people, whether done by fires consecrated to himself or to the bloody deities of the Syrian nations. "There shall not be found (says he) among you any one that maketh his son or his daughter to pass through the fire †."

153 and in the laws respecting eating, and drinking, and agriculture.

* *Spencer*, lib. ii. cap. 13.

† Deut. xvii. 10. xii. 29. and Levit. xx. 2, &c.

There are, in the Jewish law, few precepts more frequently repeated than that which prohibits the seething of a kid in its mother's milk ‡; and there being no moral fitness in this precept when considered absolutely and without regard to the circumstances under which it was given, infidel ignorance has frequently thought fit to make it the subject of profane ridicule. But the ridicule will be forborne by those who know that, among the nations round Judea, the feasting on a kid boiled in its mother's milk was an essential part of the impious and magical ceremonies celebrated in honour of one of their gods, who was supposed to have been suckled by a she-goat. Hence, in the Samaritan Pentateuch, the text runs thus: "Thou shalt not seeth a kid in its mother's milk; for whoever does so, is as one who sacrifices an abominable thing, which offends the God of Jacob §." Another precept, apparently of very little importance, is given in these words: "Ye shall not round the corners of your heads, neither shalt thou mar the corners of thy beard ||." But its wisdom is seen at once, when we know that at funerals it was the practice of many of the heathens, in that early period, to round the corners of their heads, and mar their beards, that by throwing the hairs they had cut off on the dead body, or the funeral pile, they might propitiate the shade of the departed hero; and that in other nations, particularly in Phœnicia, it was customary to cut off all the hair of their heads except what grew on the crown, which, with great solemnity, was consecrated either to the sun or to Saturn *. The unlearned Christian, if he be a man of reflection, must read with some degree of wonder such laws as these: "Thou shalt not sow thy vineyard with divers seeds, lest the fruit of thy seed which thou hast sown and the fruits of thy vineyard be defiled. Thou shalt not plow with an ox and an ass together. Thou shalt not wear a garment of divers sorts, or of woollen and linen together †." But his wonder will cease when he knows that all these were practices from which the Sabian idolaters of the east expected the greatest advantages. Their belief in magic and judicial astrology led them to imagine, that by sowing different kinds of corn among their vines they should propitiate the gods which were afterwards known in Rome by the names of Bacchus and Ceres; that, by yoking animals so heterogeneous as the ox and the ass in the same plough, they should by a charm secure the favour of the deities who presided over the affairs of husbandry; and that a garment composed of linen and woollen, worn under certain conjunctions of the stars, would protect its owner, his flocks, his herds, and his field, from all malign influences, and render him in the highest degree prosperous through the whole course of his life ‡. But magical ceremonies were always performed in order to render propitious good or evil demons (see MAGIC); and therefore such ceremonies, however unimportant in themselves, were in that age most wisely prohibited in the Mosaic law, as they naturally led those who were addicted to them to the worship of idols and impure spirits.

§ *Spencer*, lib. ii. cap. 9.

|| Levit. xix. 27.

* *Spencer*, lib. ii. cap. 18.

Theology from the fall of Adam to the coming of Christ.

† Deut. xxii. 9, 10, 11.

‡ *Spencer*, lib. ii. cap. 30, 31, 33.

If the whole ritual of the Jewish economy be examined in this manner, every precept in it will be found to be directed against some idolatrous practice of the age in which it was given. It was therefore admirably calculated to keep the Israelites a separate people, and to prevent too close an intercourse between them and their Gentile neighbours. The distinction made by their law between clean and unclean animals (see SLAVERY, N° 33.) rendered it impossible for them, without a breach of that law, to eat and drink with their idolatrous neighbours; their sacred and civil ceremonies being directly levelled against the Egyptian, Zabian, and Canaanitish superstitions, had a tendency to generate in their minds a contempt of those superstitions; and that contempt must have been greatly increased by their yearly, monthly, and daily sacrifices, of the very animals which their Egyptian masters had worshipped as gods.

154 The Mosaic laws enforced by temporal sanctions.

That these laws might have the fuller effect on minds gross and carnal, they were all enforced by temporal sanctions. Hence it is that Moses assured them, that if they would hearken to God's judgements, and keep them, and do them, they should be blessed above all people; threatening them at the same time with utter destruction if they should at all walk after other gods, and serve them, and worship them §. Nor were these temporal rewards and punishments held out only to the nation as a collective body; they were promised and threatened to every individual in his private capacity as the certain consequences of his obedience or disobedience. Every particular Hebrew was commanded to honour his father and mother, that it might go well with him, and that his days might be prolonged; whilst he who cursed his father or his mother was surely to be put to death. Against every idolater, and even against the wilful transgressor of the ceremonial law, God repeatedly declared that he would set his face, and would cut off that man from among his people: and that individuals, as well as the nation, were in this life actually rewarded and punished according to their deserts, has been proved by Bishop Warburton ||. Indeed the Mosaic

§ Deut. *passim*.

|| *Div. Leg.* book v. sect. 4.

Theology from the fall of Adam to the coming of Christ.

ſaic law, taken in its literal ſenſe, holds out no other proſpects to the Iſraelites than temporal happineſs; ſuch as, health, long life, peace, plenty, and dominion, if they ſhould keep the covenant; and temporal miſery, viz. diſeaſes, immature death, war, famine, want, ſubjection, and captivity, if they ſhould break it. "See (ſays Moſes), I have ſet before thee this day life and good, death and evil; in that I command thee this day to love the Lord thy God, to walk in his ways, and to keep his commandments, and his ſtatutes, and his judgements, that thou mayeſt live and multiply; and the Lord thy God ſhall bleſs thee in the land whither thou goeſt to poſſeſs it. But if thine heart turn away, ſo that thou wilt not hear, but ſhalt be drawn away, and worſhip other gods, and ſerve them; I denounce unto you this day, that ye ſhall ſurely periſh, and that ye ſhall not prolong your days upon the land whither thou paſſeſt over Jordan to poſſeſs it." And elſewhere, having informed them that, upon their apoſtacy, their land ſhould be rendered like Sodom and Gomorrah, he adds, that all men ſhould know the reaſon of ſuch barrenneſs being brought upon it, and ſhould ſay, "Becauſe they have forſaken the covenant of the Lord God of their fathers, which he made with them when he brought them forth out of the land of Egypt, the anger of the Lord was kindled againſt this land, to bring upon it all the curſes that are written in this book *."

* Deut. xxx. 15—19. xxxix. 25.

155 Whence it has been raſhly inferred that the ancient Hebrews had no hope beyond the grave.

From this fact, which ſcarcely any man of letters will venture to deny, ſome divines have concluded, that the ancient Iſraelites had no hope whatever beyond the grave; and that in the whole Old Teſtament there is not a ſingle intimation of a future ſtate. That many of the lower claſſes, who could neither read nor write, were in this ſtate of darkneſs, may be true; but it is impoſſible that thoſe who underſtood the book of Geneſis could be ignorant that death came into the world by the tranſgreſſion of their firſt parents, and that God had repeatedly promiſed to redeem mankind from every conſequence of that tranſgreſſion. They muſt likewiſe have known that, before the deluge, Enoch was tranſlated into heaven without taſting death; that afterwards Elijah had the ſame exemption from the common lot of humanity; and that, as God is no reſpecter of perſons, every one who ſerved him with the zeal and fidelity of theſe two prophets would, by ſome means or other, be made capable of enjoying the ſame rewards. The God of Abraham, Iſaac, and Jacob, was not the God of the dead, but of the living.

In the earlieſt periods of their commonwealth, the Iſraelites could, indeed, only *infer*, from different paſſages of their ſacred books, that there would be a general reſurrection of the dead, and a future ſtate of rewards and puniſhments; but from the writings of the prophets it appears, that before the Babyloniſh captivity that doctrine muſt have been very generally received. In the Pſalms, and in the prophecies of Iſaiah, Daniel, and Ezekiel, there are ſeveral texts which ſeem to us to prove, incontrovertibly, that, at the time when theſe inſpired books were written, every Iſraelite who could read the ſcriptures muſt have had ſome hopes of a reſurrection from the dead. We ſhall conſider two of theſe texts, becauſe they have been quoted by a very learned and valuable writer in ſupport of an opinion the reverſe of ours.

In a ſublime ſong, compoſed with a view to incite the people to confidence in God, the prophet Iſaiah has theſe remarkable words; "Thy dead men ſhall live; together with my dead body ſhall they ariſe. Awake and ſing, ye that dwell in the duſt; for thy dew is as the dew of herbs, and the earth ſhall caſt out the dead *." We agree with Biſhop Warburton that theſe words are figurative, and that they were uttered to give the Iſraelites conſolation in very diſaſtrous times. The purpoſe of the prophet was to aſſure them, that though their community ſhould, in Babylon, be as completely diſſolved as a dead body reduced to duſt, yet God would reſtore them to their own land, and raiſe that community again to life. This was indeed a prophecy only of a temporal deliverance; but as it is expreſſed in terms relating to the death and reſurrection of man, the doctrine of a reſurrection muſt then have been well known, and generally received, or ſuch language would have been altogether unintelligible.

156 This opinion confuted.

* Chap. xxvi. 19.

The prophet Ezekiel, when the ſtate of things was moſt deſperate, is carried by the Spirit into a valley full of dry bones, and aſked this queſtion; "Son of man, can theſe bones live?" To which he anſwers; "O Lord God, thou knoweſt †." He was not aſked if *all* the dead would riſe at the laſt day; but only if the particular bones *then* preſented to him could live at *that time*, and while other bones were mouldering in corruption: and to ſuch a queſtion we cannot conceive any anſwer that a man brought up in the belief of a general reſurrection could have given, but—"O Lord God, thou knoweſt." Had Ezekiel been a ſtranger to the doctrine of a general reſurrection, or had he not believed that doctrine, he would doubtleſs have anſwered the queſtion that was put to him in the negative; but convinced that *all* men are at *ſome* period to riſe from the dead, "that every one may receive the things done in his body, according to that he hath done, whether it be good or bad," he very naturally ſaid, that God alone knew whether the bones then exhibited to him in the valley would riſe before the general reſurrection.

† Chap. xxxvii. 3.

But though the more intelligent and righteous Iſraelites certainly "all died in faith, and not having received the promiſes, but having ſeen them afar off, were perſuaded of them and embraced them, confeſſing that they were ſtrangers and pilgrims on earth, who deſired a better country, that is, a heavenly one ‡," we are not to ſuppoſe that this heavenly deſire aroſe from any thing taught in the law of Moſes. That law, when taken by itſelf, as unconnected with prior and ſubſequent revelations, makes no mention whatever of a heavenly inheritance, which St Paul aſſures us § was given 430 years before to Abraham by a promiſe which may be traced back to the firſt ray of comfort vouchſafed to fallen man in the ſentence paſſed on the original deceiver. "Wherefore then ſerved the law? It was added (ſays the apoſtle), becauſe of tranſgreſſions, till the ſeed ſhould come to whom the promiſe was made." The tranſgreſſions here alluded to were polytheiſm and idolatry, which, with a train of cruel and deteſtable vices, had overſpread the whole world; and the primary intention of the law was to ſtem the torrent of theſe corruptions, for which we have ſeen it was admirably calculated; and, like a ſchoolmaſter, to inſtruct the Iſraelites in the unity and worſhip of Jehovah, and thus by degrees bring them to Chriſt.

157 The hope of the Hebrews, however, not from their own law.

‡ Heb. xi. 3, &c.

§ Gal. iii. 16—19.

But

Theology from the fall of Adam to the coming of Christ.

But though it is apparent that a future ſtate of rewards and puniſhments made no part of the Moſaic diſpenſation, yet the law had certainly a ſpiritual meaning to be underſtood when the fulneſs of time ſhould come. Every Chriſtian ſees a ſtriking reſemblance between the ſacrifice of the paſchal lamb, which delivered the Iſraelites from the deſtroying angel in Egypt, and the ſacrifice of the Lamb of God, which taketh away the ſin of the world. Indeed the whole ritual of ſacrifice muſt have led the more intelligent of them to faith in a future ſacrifice; by which, while the heel of the ſeed of the woman ſhould be bruiſed, the head of the ſerpent ſhould be completely cruſhed (ſee SACRIFICE); and as prophets were raiſed up from time to time, to prepare them for the coming of the Meſſiah, and to foretel the nature of his kingdom, there can be no doubt but that thoſe inſpired teachers would lay open to them, as far as was expedient, the temporary duration of the Moſaic law, and convince them that it was only the ſhadow of better things to come. From the nature of their ritual, and the different prophecies vouchſafed them, which became more and more explicit as the time approached for their accompliſhment, they muſt ſurely have been led to expect redemption from the curſe of the fall by the ſufferings of their Meſſiah; but that any one of them knew preciſely the *manner* in which they were to be redeemed, and the nature of that religion which was to ſuperſede their own, is wholly incredible. Such knowledge would have made them impatient under the yoke of ordinances to which they were ſubjected; for after the Chriſtian faith came into full ſplendour, mankind could be no longer under the tuition of ſuch a ſchoolmaſter as the law, which "had only a *ſhadow* of good things; and ſo far from their reality, not even the very *image* of them *." Through theſe ſhadows, however, the Jews, aided by the clearer light of prophecy, though it too ſhone in a dark place, might have ſeen enough of God's plan of redemption to make them acknowledge Jeſus of Nazareth, when he came among them working miracles of mercy, for the Meſſiah ſo long promiſed to their forefathers, and in whom it was repeatedly ſaid, that all the nations of the earth ſhould be bleſſed.

158 Why the law was typical.

* Heb. x. 1.

159 Means uſed to prepare the world for the coming of Chriſt.

While ſuch care was taken to prepare the deſcendants of Abraham for the coming of the Prince of Peace, we muſt not ſuppoſe that God was a reſpecter of perſons, and that the reſt of the world was totally neglected. The diſperſion of the ten tribes certainly contributed to ſpread the knowledge of the true God among the eaſtern nations. The ſubſequent captivity of the tribes of Judah and Benjamin muſt have confirmed that knowledge in the great empires of Babylon and Perſia; and that particular providence of God which afterwards led Ptolemy Philadelphus to have the Jewiſh ſcriptures tranſlated into the Greek language, laid the divine oracles open to the ſtudy of every accompliſhed ſcholar. At laſt, when the arms of Rome had conquered the civilized world, and rendered Judea a province of the empire; when Auguſtus had given peace to that empire, and men were at leiſure to cultivate the arts and ſciences; when the different ſects of philoſophers had by their diſputations whetted each others underſtandings, ſo that none of them was diſpoſed to ſubmit to an impoſture; and when the police of the Roman government was ſuch that intelligence of every thing important was quickly tranſmitted from the moſt diſtant provinces to the capital of the empire; "when that fulneſs of time was come, God ſent forth his Son made of a woman, made under the law, to redeem them that were under the law, that we might receive the adoption of ſons," and be reſtored to that inheritance of which the forfeiture introduced the ſeveral diſpenſations of revealed religion into the world.

Theology from the fall of Adam to the coming of Chriſt.

SECT. V. *View of Theology more peculiarly Chriſtian.*

MANKIND being trained by various diſpenſations of providence for the reception of Jeſus Chriſt, and the time fixed by the prophets for his coming being arrived, "a meſſenger was ſent before his face to prepare his way before him by preaching the baptiſm of repentance for the remiſſion of ſins." This meſſenger was John the Baptiſt, a very extraordinary man, and the greateſt of all the prophets. His birth was miraculous, the ſcene of his miniſtry the wilderneſs, his manners auſtere, and his preaching upright, without reſpect of perſons. He frankly told his audience that he was not the Meſſiah, that the Meſſiah would ſoon appear among them, that "he was mightier than himſelf, and that he would baptiſe them with the Holy Ghoſt and with fire."

160 Chriſt the divine word incarnate.

Mightier indeed he was; for though born of a woman the Meſſiah was not the ſon of a human father; and though living for the firſt thirty years of his life in obſcurity and poverty, he was the lineal deſcendant of David, and heir to the throne of Iſrael. But the dignity of his human deſcent, great as it was, vaniſhes from conſideration when compared with the glory which he had with his Father before the world was. The Jewiſh diſpenſation was given by the miniſtry of Moſes, and illuſtrated by ſubſequent revelations vouchſafed to the prophets; the immediate author of the Chriſtian religion is the λογος or the ſecond perſon of the bleſſed Trinity, of whom St John declares, that "he was in the beginning with God, and was God; that all things were made by him; and that without him was not any thing made that was made." We have already proved that in the one Godhead there is a Trinity of perſons; and that the λογος is one of the three, is apparent from theſe words of the apoſtle, and from many other paſſages of ſacred ſcripture. Thus he is called *the Lord of hoſts himſelf; the firſt and the laſt, beſides whom there is no God; the moſt high God; God bleſſed for ever; the mighty God, the everlaſting Father, Jehovah our righteouſneſs;* and *the only wiſe God our Saviour* (B). This great Being, as the ſame apoſtle aſſures us, was made fleſh, and dwelt among men; not that the divine nature was or could be changed into humanity, for God is immutable, the ſame almighty and incomprehenſible Spirit,

(B) Iſaiah viii. 13, 14. compared with 1 Peter ii. 7, 8.; Iſaiah vi. 5. compared with John xii. 41.; Iſaiah xliv. 6. compared with Revelation xxii. 13.; Pſalm lxxviii. 56. compared with 1 Corinthians x. 9. Romans ix. 5. Iſaiah ix. 6. Jeremiah xxiii. 6. Jude.

Theology more peculiarly Christian.

Spirit yesterday, to-day, and forever; but the Word or second person in the godhead, assuming a human soul and body into a personal union with himself, dwelt upon earth as a man, veiling his divinity under mortal flesh. Hence he is said elsewhere to have been "manifested in the flesh," and "to have taken upon him the nature of man;" phrases of the same import with that which asserts "the WORD to have been made flesh."

161 Objections to the incarnation of the Word.

This incarnation of the Son of God is perhaps the greatest mystery of the Christian faith, and that to which ancient and modern heretics have urged the most plausible objections. The doctrine of the Trinity is indeed equally incomprehensible; but the nature of God and the mode of his subsistence, as revealed in scripture, no man, who thinks, can be surprised that he does not comprehend; for a revelation which should teach nothing mysterious on such a subject would be as incredible and as useless as another which contained nothing but *mystery*. The difficulty respecting the incarnation, which forces itself on the mind, is not how two natures so different as the divine and human can be so intimately united as to become one person; for this union in itself is not more inconceivable than that of the soul and body in one man; but that which at first is apt to stagger the faith of the reflecting Christian is the infinite distance between the two natures in Christ, and the comparatively small importance of the object, for the attainment of which the eternal Son of God is said to have taken on him our nature.

162 obviated.

Upon mature reflection, however, much of this difficulty will vanish to him who considers the ways of Providence, and attends to the meaning of the words in which this mystery is taught. The importance of the object for which the WORD condescended to be made flesh, we cannot adequately know. The oracles of truth indeed inform us, that Christ Jesus came into the world to save sinners; but there are passages scattered through the New Testament * which indicate, not obscurely, that the influence of his sufferings extends to other worlds besides this: and if so, who can take on him to say, that the quantity of good which they may have produced was not of sufficient importance to move even to this condescension a Being who is emphatically styled LOVE?

* Eph. i. 10. Col. i. 19, 20.

But let us suppose that every thing which he did and taught and suffered was intended only for the benefit of man, we shall, in the daily administration of providence, find other instances of the divine condescension; which, though they cannot be compared with the incarnation of the second person in the blessed Trinity, are yet sufficient to reconcile our understandings to that mystery when revealed to us by the Spirit of God. That in Christ there should have dwelt on earth "all the fulness of the Godhead bodily †," is indeed a truth by which the devout mind is overwhelmed with astonishment; but it is little less astonishing that the omnipotent Creator should be intimately present at every instant of time to the meanest of his creatures, "upholding all things, the vilest reptile as well as the most glorious angel, by the word of his power ‡." Yet it is a truth self-evident, that without this constant presence of the Creator, nothing which had a beginning could continue one moment in being; that the visible universe would not only crumble into chaos, but vanish into nothing; and that the souls of men, and even the most exalted spirits of creation, would instantly lose that existence, which, as it was not of itself, and is not necessary, must depend wholly on the will of Him from whom it was originally derived. See METAPHYSICS, N° 272—276, and PROVIDENCE, N° 3.

† Col. ii.

‡ Heb. i. 3.

Theology more peculiarly Christian.

In what particular way God is present to his works, we cannot know. He is not diffused through the universe like the *anima mundi* of the ancient Platonists, or that modern idol termed the *substratum of space* (METAPHYSICS, N° 309, 310); but that he is in power as intimately present now to every atom of matter as when he first brought it into existence, is equally the dictate of sound philosophy and of divine revelation; for "in him we live and move and have our being;" and power without substance is inconceivable. If then the divine nature be not debased, if it cannot be debased by being constantly present with the vilest reptile on which we tread, why should our minds recoil from the idea of a still closer union between the second person of the ever blessed Trinity and the body and soul of Jesus Christ? The one union is indeed different from the other, but we are in truth equally ignorant of the nature of both. Reason and revelation assure us that God must be present to his works to preserve them in existence; and revelation informs us farther, that one of the persons in the Godhead assumed human nature into a personal union with himself, to redeem myriads of rational creatures from the miserable consequences of their own folly and wickedness. The importance of this object is such, that, for the attainment of it, we may easily conceive that he who condescends to be potentially present with the worms of the earth and the grass of the field, would condescend still farther to be personally present with the spotless soul and body of a man. Jesus Christ lived indeed a life of poverty and suffering upon earth, but his divine nature was not affected by his sufferings. At the very time when, as a man, he had not a place where to lay his head; as God, he was in heaven as well as upon earth *, dwelling in light inaccessible; and while, as a man, he was increasing in wisdom and stature, his divinity was the fulness of him who filleth all in all, and from whom nothing can be hid.

* John iii. 13.

Perhaps the very improper appellation of *mother of God*, which at an early period of the church was given to the Virgin Mary, may have been one cause of the reluctance with which the incarnation has been admitted; for as we have elsewhere observed (see NESTORIUS), such language, in the proper sense of the words, implies what those, by whom it is used, cannot possibly believe to be true; but it is not the language of scripture. We are there taught, that "Christ being in the form of God, thought it no robbery to be equal with God; but made himself of no reputation, and took upon him the form of a servant, and was made in the likeness of man †;" that "God sent forth his Son made of a woman, made under the law, to redeem them that were under the law, that we might receive the adoption of sons ‡;" and that "the WORD who was in the beginning with God, and was God, by whom all things were made, was made flesh, and dwelt among men (who beheld his glory, the glory as of the only begotten of the Father), full of grace and truth §:" but we are nowhere taught that, as God, he had a mother! It was indeed the doctrine of the primitive church ‖, that the very principle of personality and individual existence in Mary's

† Philip. ii. 6, 7.

‡ Gal. iv. 4, 5.

§ John i.

‖ *Horsley's Sermon on the incarnation.*

Theology more peculiarly Christian.

Mary's son, was union with the uncreated word; and this doctrine is thought to imply the miraculous conception, which is recorded in the plainest terms by two of the evangelists; for he was conceived by the Holy Ghost and born of a virgin *; but, as God, he had been begotten from all eternity of the Father, and in order of nature was prior to the Holy Ghost. This is evident from the appellation of ὁ λογος given to him by St John; for the term being used in that age, both by the Jewish rabbies and the heathen philosophers, to denote the second divine subsistence, which they considered as an eternal and necessary emanation from the first, sometimes called τ'αγαθον and sometimes το ἑν; and the apostle giving no intimation of his using the word in any uncommon sense, we must necessarily conclude, that he meant to inform us that the divinity of Christ is of eternal generation. That the term λογος was used in this sense by the later Platonists, and in all probability by Plato himself, we have sufficiently shewn in another place (see PLATONISM); and that a similar mode of expression prevailed among the Jews in the time of St John, is apparent from the Chaldee paraphrase; which, in the 110th psalm, instead of the words "the Lord said unto my Lord," has, "the Lord said unto his WORD." Again, where we are told in the Hebrew that Jehovah said to Abraham †, "I am thy shield and thy exceeding great reward," we read in the Chaldee, "my WORD is thy shield, and thy exceeding great reward." Where it is said, "your new moons and your appointed feasts my soul hateth ‡," the paraphrast hath it, "my WORD hateth;" and where it is said, that "Israel shall be saved in the Lord with an everlasting salvation §," in the same paraphrase it is, "Israel shall be saved by the WORD of the Lord with everlasting salvation." But there is a passage in the Jerusalem Targum which puts it beyond a doubt, that by the λογος the Jews understood a divine person begotten of his Father before all worlds; for commenting on Genesis iii. 22. the authors of that work thus express themselves: "The WORD of the Lord said, behold Adam, whom I created, is the only begotten upon earth, as I AM THE ONLY BEGOTTEN IN HEAVEN:" in conformity with which, Philo introduces || the Logos speaking thus of himself; Και γαρ ουτε αγεννητος ως θεος ων, ουτε γεννητος ως υμεις. *I am neither unbegotten, as God, nor begotten after the same manner as you are.*

163 His divine nature begotten of the Father.

* Matth. i. 18, &c. Luke i. 27. &c.

† Gen. xv. 1.

‡ Isaiah i. 14.

§ Isaiah xlv. 17.

|| *De Agricult.* lib. ii.

164 Orthodoxy of the Nicene creed.

From these quotations we may justly conclude, that the Nicene fathers expressed themselves properly when they declared that the only begotten Son of God was begotten of his Father before all worlds, and is God of God; for if St John had believed the λογος or WORD to be unbegotten, contrary to the belief of all who made use of the phrase at the time when he wrote, he would surely have expressed his dissent from the generally received opinion. This however he is so far from doing, that he gives the amplest confirmation of that opinion, by declaring, that "he beheld the glory of the WORD incarnate as the glory of the only begotten of the Father;" for this declaration is true only of the divinity of Christ, his human nature not being begotten of the Father, but conceived by the Holy Ghost of the Virgin Mary. Hence our blessed Lord assures us, that "as the Father HATH life in HIMSELF, so hath he GIVEN the Son to have life in himself;" that "the Son can do nothing of *himself*, but what he seeth the Father do *;" and that "he knew the Father, because he was from him and sent by him †." We must therefore agree with Bishop Pearson (c), that "though the Father and Son are both truly God, and therefore equal in respect of nature, yet the one is greater than the other, as being the fountain of the Godhead. The Father is God, but *not of God;* Light, but *not of Light.* Christ is God, but *of* God; Light, but *of* Light. There is no difference or inequality in the nature or essence, because the same in both; but the Father of our Lord Jesus Christ hath that essence of himself, from none; Christ hath the same essence, not of himself, but from him."

* St John v. 26. 19.

† John vii. 29.

165 Purpose for which Christ was sent into the world.

The great purpose for which this divine person was sent into the world, was to bruise the head of the serpent, and restore mankind to the inheritance which had been forfeited by Adam's transgression. Every dispensation of Providence from the fall had been preparatory to this restoration. Prophets had been raised from time to time to preserve in the early ages of the world the knowledge and worship of the true God: the children of Abraham had been separated from the surrounding nations for the same purpose; and by the dispersion of the ten tribes, the captivity of the other two in Babylon, and the translation of the Hebrew scriptures into the Greek language, much of the knowledge which had been revealed to the Israelites was gradually diffused over the eastern world.

But while the Jews were thus rendered the instruments of enlightening the heathen nations of antiquity, their intercourse with those nations made them almost unavoidably acquainted with the philosophy which was cultivated among the Chaldeans, the Persians, and the Egyptian Greeks; and ingrafting many of the opinions derived from those schools upon the doctrines of Moses and the prophets, they corrupted their own religion while

(c) We beg leave to recommend to our readers this author's excellent exposition of the apostle's creed, as a work which will render them great assistance in acquiring just notions of the fundamental articles of the Christian faith. They will find it, we think, a complete antidote against the poison of modern Unitarians and modern Tritheists; of whom the former teach that Jesus Christ was a mere man, the son of Joseph as well as of Mary; while the latter, running to the other extreme, maintain, that, with respect to his divinity, he is in no sense subordinate to the Father, but might have been the Father, the Son, or the Holy Ghost, according to the good pleasure of the eternal three. We have been at some pains to prove his divinity, and likewise his eternal generation; but in such a short compend as we must give, it seems not to be worth while to prove his miraculous conception. That miracle is plainly asserted in the New Testament in words void of all ambiguity; and as it is surely as easy for God to make a man of the substance of a woman as of the dust of the earth, we cannot conceive what should have induced any person professing Christianity to call it in question. The natural generation of Christ is a groundless fancy, which can serve no purpose whatever, even to the Unitarians.

Theology more peculiarly Christian.

while they improved that of their neighbours. Hence, by the time that Christ came among them, they had made the word of God of none effect through a number of idle fancies which they inculcated on the people as the traditions of the elders; and as they had attached themselves to different masters in philosophy, their unauthorised opinions were of course different according to the different sources whence they were drawn. The peculiar tenets of the ESSENES seem to have been a species of mystic Platonism. The PHARISEES are thought to have derived their origin from a Jewish philosopher of the Peripatetic school; and the resemblance between the doctrines of the SADDUCEES and the philosophy of Epicurus has escaped no man's observation.

166 Corruption of the Jews at the time of his coming.

Though these sects maintained mutual communion in public worship, they abhorred each other's distinguishing tenets; and their wranglings had nearly banished from them every sentiment of true religion. They agreed, however, in the general expectation of the Messiah promised to their fathers; but, unhappily for themselves, expected him as a great and temporal prince. To this mistake several circumstances contributed: some of their prophets had foretold his coming in lofty terms, borrowed from the ritual law, and the splendor of earthly monarchs. The necessity of casting this veil over those living oracles we have shewn in another place (see PROPHECY, N° 17.). At the time when the predictions were made, the Mosaic system had not run out half its course, and was therefore not to be exposed to popular contempt by an information that it was only the harsh rudiment of one more easy and perfect. To prevent, however, all mistakes in the candid and impartial, when the Messiah should arrive with the credentials of miraculous powers, other prophets had described him in the clearest terms as having no form nor comeliness, as a sheep dumb before his shearers, and as a lamb brought to the slaughter; but the Jews had suffered so much from the Chaldeans, the Greeks, and other nations by whom they had been conquered, and were then suffering so much from their masters the Romans, that they could think of no deliverance greater than that which should rescue their nation from every foreign yoke.

What men earnestly wish to be true, they readily believe. Hence that people, losing sight of the yoke under which they and the whole human race were brought by the fall of Adam, mistaking the sense of the blessing promised to all nations through the seed of Abraham, and devoting their whole attention to the most magnificent descriptions of the Messiah's kingdom, expected in him a prince who should conquer the Romans, and establish on earth a universal monarchy, of which Jerusalem was to be the metropolis.

167 The objects of his preaching.

As our Saviour came for a very different purpose, the first object of his mission was to rectify the notions of his erring countrymen, in order to fit them for the deliverance which they were to obtain through him. Accordingly, when he entered on his office as a preacher of righteousness, he embraced every opportunity of inveighing against the false doctrines taught as traditions of the elders; and by his knowledge of the secrets of all hearts, he exposed the vile hypocrisy of those who made a gain of godliness. The Jews had been led, by their separation from the rest of the world, to consider themselves as the peculiar favourites of Jehovah; and the consequence was, that, contrary to the spirit of their own law, and the explicit doctrines of some of their prophets, they looked on all other nations with abhorrence, as on people physically impure. These prejudices the blessed Jesus laboured to eradicate. Having desired a lawyer, by whom he was tempted, to read that part of the law of Moses which commanded the Israelites to love their neighbours as themselves, he compelled him, by means of a parabolical account of a compassionate Samaritan, to acknowledge, that under the denomination of neighbour the divine lawgiver had comprehended all mankind as the objects of love *. The importance in which Moses held the ritual law, and to which, as the means of preserving its votaries from the contagion of idolatry, it was justly intitled, had led the Jews to consider every ceremony of it as of intrinsic value and perpetual obligation: but Jesus brought to their recollection God's declared preference of mercy to sacrifice; shewed them that the weightier matters of the law, judgement, mercy, and faith, claimed their regard in the first place, and its ceremonial observances only in the second; and taught them, in conformity with the predictions of their own prophets †, that the hour was about to come when the worship of God should not be confined to Jerusalem, but that "true worshippers should everywhere worship the Father in spirit and in truth ‡."

* St Luke x. 25—38.

† Jeremiah xxxi. 31, &c.

‡ John iv. 25—27.

It being the design of Christ's coming into the world to break down the middle wall of partition between the Jews and Gentiles, and to introduce a new dispensation of religion which should unite all mankind as brethren in the worship of the true God, and fit them for the enjoyment of heaven; he did not content himself with merely restoring the moral part of the Mosaic law to its primitive purity, disencumbered of the corrupt glosses of the Scribes and Pharisees, but added to it many spiritual precepts, which, till they were taught by him, had never occurred either to Jew or Gentile. The Hebrew lawgiver had prohibited murder under the penalty of death; but Christ extended the prohibition to causeless anger, and to contemptuous treatment of our brethren, commanding his followers, as they valued their everlasting salvation, to forgive their enemies, and to love all mankind. Adultery was forbidden by the law of Moses as a crime of the deepest dye; but Jesus said to his disciples, "that whosoever looketh on a woman to lust after her, hath committed adultery with her already in his heart," and is of course liable to the Divine vengeance. The *lex talionis* was in force among the Jews, so that the man who had deprived his neighbour of an eye or a tooth, was to suffer the loss of an eye or a tooth himself; but this mode of punishment, which inflicted *blemish* for *blemish*, though suited to the hardness of Jewish hearts, being inconsistent with the mild spirit of Christianity, was abolished by our blessed Lord, who severely prohibited the indulgence of revenge, and commanded his followers to love even their enemies. Perjury has in every civilized nation been justly considered as a crime of the highest atrocity, and the Mosaic law doomed the false witness to bear the punishment, whatever it might be, which he intended by swearing falsely to bring on his brother; but the Author of the Christian religion forbade not only false swearing, but swearing at all, except on solemn occasions, and when an oath should be required by legal authority. See OATH.

By thus restoring the law to its original purity, and in

Theology more peculiarly Christian.

168 In which he executed the office of a prophet.

in many cases extending its sense, the blessed Jesus executed the office of a PROPHET to the lost sheep of the house of Israel; but had he not been more than an ordinary prophet, he could not have abrogated the most trivial ceremony of it, nor even extended the sense of any of its moral precepts; for their great lawgiver had told them, that "the Lord their God would raise up unto them but one Prophet, like unto him, to whom they should hearken ‡." That Prophet was by themselves understood to be the Messiah, whom they expected to tell them all things. It was necessary therefore that Jesus, as he taught some new doctrines, and plainly indicated that greater changes would soon be introduced, should vindicate his claim to that exalted character which alone could authorise him to propose innovations. This he did in the amplest manner, by fulfilling prophecies and working miracles (see MIRACLE and PROPHECY); so that the unprejudiced part of the people readily acknowledged him to be of a truth "that prophet which should come into the world—the Son of God, and the King of Israel." He did not, however, make any change in the national worship, or assume to himself the smallest civil authority. He had submitted to the rite of circumcision, and strictly performed every duty, ceremonial as well as moral, which that covenant made incumbent on other Jews; thus fulfilling all righteousness. Though the religion which he came to propagate was in many respects contrary to the ritual law, it could not be established, or that law abrogated, but in consequence of his death, which the system of sacrifices was appointed to prefigure; and as his kingdom, which was not of this world, could not commence till after his resurrection, he yielded during the whole course of his life a cheerful obedience to the civil magistrate, and wrought a miracle to obtain money to pay the tribute that was exacted of him. Being thus circumstanced, he chose from the lowest and least corrupted of the people certain followers, whom he treated with the most endearing familiarity for three years, and commissioned at his departure to promulgate such doctrines as, consistently with the order of the divine dispensations, he could not personally preach himself. With these men, during the course of his ministry on earth, he went about continually doing good, healing the sick, casting out devils, raising the dead, reproving vice, preaching righteousness, and instructing his countrymen, by the most perfect example which was ever exhibited in the world, of whatsoever things are true, or honest, or just, or pure, or lovely, or of good report. The Scribes and Pharisees, however, finding him not that conqueror whom they vainly expected, becoming envious of his reputation among the people, and being filled with rancour against him for detecting their hypocritical arts, delivered him up to the Roman governor, who, though convinced of his innocence, yielded to the popular clamour, and crucified him between two thieves, as an enemy to Cæsar.

‡ Deut. xviii. 15.

169 His strict obedience to the law.

Just before he expired, he said, It is finished, intimating that the purpose was now fulfilled for which he had come into the world, and which, as he had formerly told his disciples, "was not to be ministered unto, but to minister, and to give his life a ransom for many ‖." For his blood, as he assured them at the institution of the Eucharist, "was to be shed for the remission of sins." That Christ died voluntarily for us, the just for the unjust, and that "there is none other name under heaven given among men whereby we must be saved," is the uniform doctrine of the prophets who foretold his coming, of John the Baptist who was his immediate harbinger, and of the apostles and evangelists who preached the gospel after his ascension into heaven. Thus Isaiah says of the Messiah *, that "he was wounded for our transgressions, and bruised for our iniquities; that the chastisement of our peace was upon him, and that with his stripes we are healed; that we had all like sheep gone astray, turning every one to his own way, and that the Lord laid on him the iniquity of us all; that he was cut out off out of the land of the living, and stricken for the transgression of God's people; that his soul or life was made an offering for sin; and that he bore the sin of many, and made intercession for the transgressors." The Baptist, "when he saw Jesus coming unto him, said to the people, Behold the Lamb of God, which taketh away the sin of the world;" plainly intimating that his death was to be a sacrifice, since it was only as a sacrifice that the Jews could form any conception of a lamb taking away sin. The epistles of St Paul are so full of the doctrine of Christ's satisfaction, that it is needless to quote particular texts in proof of it. He tells the Romans, that Jesus Christ was set forth to be a propitiation through faith in his blood; he was delivered for our offences, and "raised again for our justification; that he died for the ungodly; and that God commendeth his love towards us, in that while we were yet sinners Christ died for us." He assures the Corinthians that Christ died for all; that they who live should not henceforth live unto themselves, but to him who died for them and rose again; and that God made him to be sin for us, who knew no sin, that we might be made the righteousness of God in him." He informs the Galatians, that Christ "gave himself for our sins, that he might deliver us from this present evil world, according to the will of God and our Father; and that he redeemed us from the curse of the law, being made a curse for us." St Peter and St John speak the very same language; the former teaching us, that "Christ suffered for us, and bare our sins in his own body on the tree †; the latter, that the blood of Jesus Christ cleanseth us from all sin, and that he is the propitiation for our sins; and not for our sins only, but also for the sins of the whole world ‡." That he came into the world for the purpose of suffering, appears from his own words: for "no man (said he §) taketh my life from me, but I lay it down of myself: I have power to lay it down, and I have power to take it again. This commandment have I received from my Father." And that he voluntarily laid it down for mankind, is evident from his calling himself the Good Shepherd, and adding, that "the Good Shepherd giveth his life for the sheep ‖."

‖ Matth. xx. 28.

Theology more peculiarly Christian.

170 He voluntarily died for us.

* Chap. liii.

† 1 Peter ii. 21, and 24.

‡ 1 John i. 7. ii. 2.

§ St John x. 18.

‖ *Ibid.* ver 11.

171 Different opinions respecting the nature and extent of the benefit reaped from his death.

That Christ died for the benefit of the human race, is a truth so apparent from these texts, that no man professing Christianity has hitherto called it in question. Very different opinions have been formed indeed concerning the nature and extent of that benefit, and the means by which it is applied; but that the passion and death of the blessed Jesus were essential parts of his ministry on earth, has seldom been controverted. That on the cross he made satisfaction to his Father for the sins of the world, is the general belief of Christians; but presumptuous men, aiming at being wise beyond what is written, have started a thousand idle questions concerning the necessity of

Theology more peculiarly Christian.

of ſuch ſatisfaction, and the manner in which it was made. Some limiting the power and mercy of the Omnipotent, have dared to affirm that God *could not* have pardoned man without receiving full ſatisfaction for his offences; that nothing but the ſhedding of the blood of Chriſt could make that ſatisfaction; that his death was indeed ſufficient to atone for a thouſand worlds; that, however, he did not die for all mankind, but only for a choſen few, ordained to eternal life by a ſecret decree before the foundation of the world; and that the reſt of the race are paſſed by, and doomed to eternal perdition, for the glory of God's juſtice. Others, convinced by every thing around them that the Creator and Governor of the univerſe is a being of infinite benevolence, whoſe only end in giving life muſt have been to communicate happineſs, have contended, that no atonement whatever could be neceſſary to obtain from him the forgiveneſs of ſin on ſincere repentance; that it is contrary to all our notions of juſtice to puniſh the innocent for the guilty; and that therefore the death of Chriſt, though the eſſential part of his miniſtry, could not be neceſſary, but at the moſt expedient.

We enter not into theſe debates. The Scriptures have nowhere ſaid what God could or could not do; and on this ſubject we can know nothing but what they have taught us. That "we are reconciled to God by the death of his Son," is the principal doctrine of the New Teſtament; and without preſuming to limit the power, the mercy, or the wiſdom, of him who created and ſuſtains the univerſe, we ſhall endeavour to ſhow that it is a doctrine worthy of all acceptation. In doing this, we ſhall ſtate impartially the opinions which pious men have held reſpecting the form or manner in which Chriſt by his death made ſatisfaction to God for the ſins of the world; and we hope that our readers will embrace that opinion which ſhall appear to them moſt conſonant to the general ſenſe of ſacred Scripture.

172 Opinions of the Calviniſts

The ſtricteſt adherents to the theological ſyſtem of Calvin, interpreting literally ſuch texts of Scripture as ſpeak of his being *made ſin* for us, of his *bearing our ſins in his own body on the tree*, and of the Lord's *laying on him the iniquity of us all*, contend, that the ſins of the elect were lifted off from them and laid on Chriſt by *imputation*, much in the ſame way as they think the ſin of Adam is imputed to his poſterity. "By bearing the ſins of his people (ſays Dr Gill*) he took them off from them, and took them upon himſelf, bearing or carrying them, as a man bears or carries a burden on his ſhoulders. There was no ſin *in* him inherently, for if there had, he would not have been a fit perſon to make ſatisfaction for it; but ſin was *put* upon him by his Divine Father, as the ſins of the Iſraelites were put upon the ſcape-goat by Aaron. No creature (continues he) could have done this; but the LORD hath laid on him, or made to meet on him, the iniquity of us all, not a ſingle iniquity, but a whole maſs and lump of ſins collected together; and laid as a common burden upon him, even the ſins of all the elect of God. This phraſe of laying ſin on Chriſt is expreſſive of the *imputation* of it to him; for it was the will of God not to impute the

* *Body of Divinity*, vol. ii. book iii. chap. v. § 4.

Theology more peculiarly Chriſtian.

tranſgreſſions of his elect to themſelves, but to Chriſt, which was done by an act of his own; for he hath made him to be ſin for us, that is, by *imputation*, in which way we are made the righteouſneſs of God in him; that being imputed to us by him as our ſins were to Chriſt. The ſenſe (ſays our author) is, a charge of ſin was brought againſt him as the ſurety of his people. He was numbered with the tranſgreſſors; for bearing the ſins of many, he was reckoned as if he had been a ſinner himſelf, ſin being *imputed* to him; and he was dealt with as ſuch. Sin being found upon him by *imputation*, a demand of ſatisfaction for ſin was made, and he anſwered it to the full. All this was with his own conſent. He *agreed* to have ſin laid upon him, and *imputed* to him, and a charge of it brought againſt him, to which he engaged to be reſponſible; yea, he himſelf took the ſins of his people upon him; ſo the evangeliſt Matthew has it, 'He himſelf took our infirmities, and bore our ſicknesses †.' As he took the nature of men, ſo he took their ſins, which made his fleſh to have *the likeneſs of ſinful fleſh*, though it really was not ſinful. What Chriſt bore being laid upon him, and imputed to him, were *ſins* of all ſorts, original and actual; ſins of every kind, open and ſecret, of heart, lip, and life; all acts of ſin committed by his people, for he has redeemed them from all their iniquities; and God, for Chriſt's ſake, forgives all treſpaſſes, his blood cleanſes from all ſin, and his righteouſneſs juſtifies from all; all being imputed to him as that is to them. Bearing ſin ſuppoſes it to be a burden; and indeed it is a burden too heavy to bear by a ſenſible ſinner (E). When ſin is charged home upon the conſcience, and a ſaint groans, being burdened with it, what muſt that burden be, and how heavy the load which Chriſt bore, conſiſting of all the ſins of all the elect from the beginning of the world to the end of it? and yet he ſunk not, but ſtood up under it; failed not, nor was he diſcouraged, being the mighty God, and the Man of God's right hand, made ſtrong for himſelf."

† Chap. viii. 17.

173 Objected to.

To the Arminians or Remonſtrants, this doctrine of the imputation of the ſins of men to the Son of God appears as abſurd as the ſimilar doctrine of the imputation of the ſin of Adam to his unborn poſterity; and it is certainly attended with conſequences which have alarmed ſerious Chriſtians of other denominations.

Were it poſſible in the nature of things, ſays the Arminian, to tranſfer the guilt of one perſon to another, and to lay it upon him as a burden, it could not be done without violating thoſe laws of equity which are eſtabliſhed in the ſcripture and engraven on the human heart. But this is not poſſible. To talk of lifting lumps of ſin, or tranſferring them like burdens from the guilty to the innocent, is to utter jargon, ſays he, which has no meaning; and we might with as much propriety ſpeak of lifting a ſcarlet colour from a piece of cloth and laying it on the ſound of a trumpet, as of literally lifting the ſins of the elect from them and laying them on Chriſt. Guilt is ſeated in the mind; and no man can become a ſinner but by an act of volition. If Chriſt therefore *really* took upon him the ſins of his people, he muſt have deliberately formed a wiſh to have actually

committed

(E) By the phraſe *a ſenſible ſinner*, the learned author means a ſinner who is not paſt feeling, but has a conſcience alive to the ſenſe of remorſe.

Theology more peculiarly Christian.

committed all these sins; but such a wish, though it would have made him inherently guilty, and therefore incapable of satisfying for sin, could not have cancelled deeds that were done before he was born, or have made those innocent who really had been sinners. A deed once done cannot be undone; a volition which has been formed cannot be annihilated. By sincere repentance, the habitual dispositions are indeed changed, and those who have been sinners become objects of mercy; but no power can recal the hours that are past, or make those actions which have been performed to have been not performed. To remove guilt from the sinner and lay it on the innocent may therefore be safely pronounced impossible even for Omnipotence itself, for it implies that a thing may be and not be at the same instant of time; and the doctrine which teaches that this removal was made from the elect to Christ, is an imagination of yesterday, which has no countenance from scripture, and is contrary to the established constitution of things. Those who imagine that guilt may be propagated from father to son, have something like an argument to urge for the imputation of Adam's sin to his numberless posterity; for all the men and women who have by ordinary generation been introduced into the world, have undoubtedly derived their nature from the primeval pair. But Christ did not derive his nature from the *elect*, that their sins should be communicated to him; nor, as he was miraculously conceived by the Holy Ghost, can we attribute to him any degree of that *taint* which is supposed to have been conveyed from Adam to all the other generations of men.

174 Texts on which they are built explained.

Nothing more, therefore, can be meant by "Christ's being made sin for us," and "bearing our sins in his own body on the tree," or by God's "laying upon him the iniquity of us all," than that by his sufferings we are freed from the punishment of our sins; it being in scripture a common figure of speech, as even Dr Gill has somewhere acknowledged, to denote by the word *sin* the *consequences* of sin. That this figure is used in those texts from which he infers that Christ took the sins of the elect on himself, is evident from the verse which he quotes from the gospel of St Matthew; in which it is said, that "himself took our infirmities and bore our sicknesses." The sicknesses and infirmities there alluded to are the leprosy, the palsy, the fever, and demoniacal possessions: but when our blessed Lord cured these diseases, surely he did not by his omnipotent word lift them off from the patients and take them on himself, so as actually to become a leper, a paralytic, and a dæmonic, or even to be reckoned as such either by the multitude, or by the priests, whose duty it was to take cognizance of every illegal uncleanness *. And if his inveterate enemies did not *impute* to him the leprosy when he removed that plague from others, why should it be supposed that his own Father, to whom he was at all times well-pleasing, imputed to him the sins of which, by his sufferings, he removed the punishment from those who were guilty? To impute to a person any action, whether virtuous or vicious, which he did not perform, can proceed only from ignorance, or malice, or partiality; but God is no respecter of persons, and from ignorance and malice he is removed to an infinite distance. It is indeed an undoubted truth, that "the Lord Jesus, by his perfect obedience and sacrifice of himself, which he through the eternal spirit once offered up unto God, hath fully satisfied the justice of his Father; and purchased not only reconciliation, but an everlasting inheritance in the kingdom of heaven for all those whom the Father hath given him †;" but that he actually took on himself the sins of mankind, or that those sins were imputed to him by God, who punished him as a person whom he considered as guilty, is a doctrine equally injurious to the justice of the Father and to the immaculate purity of the Son.

* Levit. xiii.

† *Confession of Faith*, chap. viii. § 5.

175 They have probably contributed to make Socinus deny the doctrine of redemption.

The earnestness with which this doctrine was inculcated by some of the earliest reformers, and the impossibility of admitting it, which every reflecting and unprejudiced mind must feel, was probably one of the causes which drove Socinus and his followers to the other extreme of denying Christ's satisfaction altogether, and considering his death as nothing more than that of an ordinary martyr, permitted for the purpose of attesting the truth of his doctrine, and paving the way for his resurrection, to confirm the great promise of immortality. According to these men, forgiveness is freely dispensed to those who repent, by the essential goodness of God, without regard to the merit or sufferings of any other being; and the gospel is said to save from sin, because it is the most perfect lesson of righteousness. The great objection of *Crellius* to the doctrine of the satisfaction is, that it is a hinderance to piety; for if Christ has paid the whole debt, he thinks that he must have nothing to do, as nothing more can be required of us. And if it were indeed true that our sins are imputed to Christ, and his righteousness imputed to us, this objection would be insurmountable; for God could not justly exact a double punishment for the same sin, or inflict misery on those to whom he imputes perfect righteousness. But as to this imaginary transferring of virtues and vices from one person to another, the scriptures give no countenance; so they nowhere call the death of Christ a *satisfaction* for the sins of men. The term has indeed been long in use among divines, and when properly explained it may be retained without any danger; but in treating of this subject, it would perhaps be more prudent to restrict ourselves to the use of scripture language, as the word *satisfaction* carries in it the ideas of a debt paid and accepted; whereas it is said by St Paul, that "eternal life is the *gift* of God through Jesus Christ our Lord; and that we are justified *freely by his grace* through the redemption that is in Jesus Christ, whom God hath set forth to be a propitiation through faith in his blood."

176 The death of Christ restored to mankind what they had lost in

To clear up this matter, and attain adequate notions of redemption and justification, it will be necessary to look back to the fall of our first parents; for the great purpose for which Christ was promised, and for which he came into the world, was, by bruising the head of the serpent, to restore mankind to the inheritance which they had lost through the transgression of Adam. This is apparent not only from the original promise made to the woman, but also from different passages in the epistles of St Paul, who expressly calls Christ the second Adam, and says, that, "as by the offence of one, judgement came upon all men to condemnation; even so by the righteousness of one, the free gift came upon all men unto justification of life;" that "as by one man's disobedience many were made sinners, so by the obedience of one shall many be made righteous;" and that, "as in Adam all die, even so in Christ shall all be made alive."

Theology more peculiarly Christian.

alive." Hence it was that John the Baptist, when he saw Jesus coming to him, said to his disciples †, "Behold the Lamb of God which taketh away, not the *sins*, but the *sin* of the world," evidently alluding to Adam's sin and its consequences, since no other sin was ever committed of which the consequences extend to the whole world.

† Ch. i. ver. 23.

This being the case, it is undeniable, that whatever we lost in the first Adam is restored to us by the second; and therefore they who believe that the punishment denounced against eating the forbidden fruit was death *corporal*, *spiritual*, and *eternal*, must believe that we are redeemed from all these by Christ; who having "appeared once in the end of the world to put away sin by the sacrifice of himself, died for us, that whether we wake or sleep, we should live together with him *." If the image of God in which man was created was lost by the breach of the first covenant, it is more than restored to us "by the Mediator of a better covenant, which is established upon better promises;" if by the sin of Adam we were utterly indisposed, disabled, and made opposite to all that is spiritually good, and wholly inclined to all evil, and that continually, we are freed from that dreadful curse by "our Saviour Jesus Christ, who gave himself for us, that he might redeem us from all iniquity, and purify to himself a peculiar people zealous of good works †;" and if for our share in the first transgression we be justly liable to all punishments in this world and in that which is to come, the apostle assures us, that "when we were enemies we were reconciled to God by the death of his Son, because that God was in Christ reconciling the world to himself, not imputing their trespasses unto them ‡." As Jesus is "the Lamb slain in the divine decree from the foundation of the world," these beneficial consequences of his death have been extended by a retrospective view to all in every age whose names are written in the book of life, though it is absurd to suppose that he literally took their sins upon him, and impious to imagine that he suffered under the imputation of sin.

* Heb. ix. 26. 1 Thess. v. 10.

† Titus ii. 14.

‡ Rom. v. 10. 2 Cor. v. 19.

177 Moderate Calvinists and Remonstrants of the same opinion.

Such is the general doctrine of redemption, as it is taught by the more moderate Calvinists and more moderate Remonstrants; for moderate Christians of all denominations, though they express themselves differently, have nearly the same views of the fundamental articles of their common faith. It must not, however, be concealed, that many divines of great learning and piety contend strenuously against the doctrine of vicarious atonement for actual transgressions of the moral law. These are the more zealous Arminians, who deny that we inherit any mortal taint or intellectual weakness from our first parents, whom they believe never to have been in a state of greater perfection than many of their posterity who are called *degenerate*. According to them, we lost nothing by the fall of Adam but our title to eternal life or perpetual existence, together with those graces of the Holy Spirit which were bestowed under the first covenant to train mankind for the society of heaven; and as eternal life and supernatural grace constituted one free-gift, not due to the nature of man, or indeed of any created being, they might, when forfeited, be restored by any means or on any condition which should seem expedient to the all-wise Donor. These means, and that condition, human reason cannot indeed discover; but it seems very fit that they should be different from the means by which moral agents under the law of nature can secure to themselves the favour of their Creator, or recover it when occasionally lost. The former depends on arbitrary will and pleasure, or at least on no other principles discoverable by us; while the latter arises out of the established and well-known constitution of things. Thus moral virtue, comprehending piety, was the condition of that favour and protection which man, in his original state, could claim from his Maker; but obedience to a positive command was the condition of the free gift of immortality conferred on Adam on his introduction into paradise. The claim arising from the relation between the creature and the Creator is indissoluble, because that relation cannot be dissolved: so that the man who, by a transgression of the moral law has forfeited the favour of God, may reasonably hope to recover it by sincere repentance and a return to his duty: and nothing but such repentance and reformation can recover it; because, in a moral agent, nothing can be agreeable to God but moral dispositions, which cannot be transferred from one person to another, and for the want of which nothing can atone. Our virtues are not required nor our vices prohibited, as if the one could profit and the other injure him who created us; for "is it any *pleasure* to the Almighty that we are righteous? or is it *gain* to him that we make our ways perfect? Will he reprove us for *fear* of us?" No! He commands us to be virtuous, and forbids us to be vicious, only because virtue is necessary to our own happiness, and vice productive of everlasting misery.

178 Doctrine of the more zealous Arminians.

Were an immoral man to be introduced into the society of angels and just men made perfect, he would not experience in that society what we are taught to expect from the joys of heaven; because to such joys his acquired dispositions would be wholly repugnant. Nor could the sufferings of any person whatever, or the *imputation* of any extrinsic righteousness, make that mind which had long been immersed in the grossest sensuality relish the intellectual and refined enjoyments of heaven; or the man who had been the habitual slave of envy, malice, and duplicity, a fit inhabitant of that place where all are actuated by mutual love. On the other hand, say the divines whose doctrine we are now detailing, it is impossible to suppose that the Father of mercies, who knows whereof we are made, should have doomed to eternal misery any moral agent who had laboured through life to serve him in sincerity and in truth; or that any atonement could be necessary to redeem from the pains of hell the man whose pious and virtuous dispositions have through penitence and prayer become suited to the society of heaven. Unsinning perfection never was nor ever could be expected in man. He is brought into the world free indeed from vice, but equally destitute of virtue; and the great business of his life is to guard his mind from being polluted by the former, and to acquire dispositions habitually leading to the practice of the latter. Till these habits be fairly formed, it seems impossible that he should not sometimes deviate from the paths of rectitude, and thereby incur a temporary forfeiture of the divine favour; but the very constitution of his mind, and the purpose for which he is placed in a state of probation, show that the divine favour thus forfeited can be recovered only by repentance and reformation.

Widely

Theology more peculiarly Christian.

179 That Christ died to redeem us from the power of the grave.

Widely different, however, is the case with respect to the forfeiture and recovery of a free gift, to which man has no natural claim. When the condition is broken on which such a gift was bestowed, repentance can be of no avail; it must be either irrecoverably lost, or restored by the mere good pleasure of the giver. Immortality or perpetual existence is a gift which upon certain terms was freely bestowed upon the human race, and forfeited by the transgression of their first parent violating those terms. It was restored by the free grace of God, who was pleased to ordain, that "since by man came death, by man should also come the resurrection of the dead; for as in Adam all die, even so in Christ shall all be made alive. "Hence the apostle, writing to the Romans of the benefits of being the children of God, and joint-heirs with Christ, summeth up those benefits with resurrection from the dead." For the creature, i. e. mankind, was made subject (says he *) to vanity or death, not willingly, but by reason of him who hath subjected the same in hope: because the creature itself also shall be delivered from the bondage of corruption into the glorious liberty of the children of God. For we know that the whole creation groaneth, and travaileth in pain together until now: and not only *they*, but *ourselves* also, who have the first fruits of the spirit, even we ourselves groan within ourselves, waiting for the adoption, viz. *the redemption of our body* (F). That this the redemption of our body is the consequence of the sacrifice of Christ, is taught in the most explicit terms in the epistle to the Hebrews; of which the inspired author informs us, that "forasmuch as the children are partakers of flesh and blood, he also himself likewise took part of the same; that through *death* he might destroy him that had the power of death, that is the devil; and deliver them, who through fear of death were all their lifetime subject to bondage *." A vicarious atonement made with this view, the divines, whose theory we are now considering, acknowledge to be perfectly rational and consistent with the strictest justice. "The law of nature (say they †) allows not of vicarious atonements; but ordains that the man who transgresseth shall himself bear the punishment of his iniquity; a punishment which no man deserves for the faults of another, unless he be partaker of the guilt by joining in the transgression." And in proof of this their opinion, they appeal to the words of God himself, declaring to Moses,—"Whosoever hath sinned against me, him will I blot out of my book ‡." But when the free gift of immortality was lost, it was with great wisdom, say they, that God restored it through a Mediator who should make atonement by his blood for the breach of the first covenant; since such a mediation implies that the gift restored is merely of grace, to the attainment of which man could no further co-operate than by his hopes and wishes.

* Rom. viii. 20—24.

* Heb. ii. 14, 15.

† *Warburton's Div. Leg.* b. ix. and *Law's Considerations on the Theory of Religion*, part iii.

‡ Exod. xxxii. 31—34.

180 An objection.

To this view of redemption, and indeed to every view of it which we have yet taken, an objection forces itself upon the mind. Throughout the New Testament LIFE AND IMMORTALITY are considered as a *FREE gift*, and called so in express words by St Paul *. To the scheme under consideration it is essential to consider them as such; and yet we know that a large price was paid for them, as St Paul likewise acknowledges, when he twice tells the Corinthians that they were bought with a price †.

Theology more peculiarly Christian.

* Rom. v. 15.

† 1 Cor. vi. 20. vii. 23.

181 Obviated.

"To clear up this matter (says Bishop Warburton), and to reconcile the apostle to himself, who certainly was not defective either in natural sense or artificial logic, let us once again remind the reader, that life and immortality bestowed on Adam in paradise was a *FREE gift*, as appears from the history of his creation. As a *free gift*, it was taken back by the Donor when Adam fell; to which resumption our original natural rights are not subject, since natural religion teacheth, that sincere repentance alone will reinstate us in the possession of those rights which our crimes had suspended. So that when this free gift, forfeited by the *first* Adam, was recovered by the *second*, its nature continuing the same, it must still remain a *free gift*—a gift to which man, by and at his creation had no claim; a gift which natural religion did not bestow. But if misled by measuring this *revealed mystery* of human redemption by the scant idea of human transactions, where a *free gift* and *purchased benefit* are commonly opposed to one another, yet even here we may be able to set ourselves right, since, with regard to man, the character of a *free gift* remains to *immortality restored*. For the price paid by forfeited man was not paid by him, but by a Redeemer of divine extraction, who was pleased, by participating of man's nature, to stand in his stead. Hence the sacred writers seeing, in this case, the perfect agreement between a *FREE GIFT* and a *PURCHASED POSSESSION*, call it sometimes by the one and sometimes by the other name ‡."

‡ *Div. Leg.* book 9. ch. 2.

182 The death of Christ an atonement only indirectly for actual sin.

A restoration to life and immortality from that state of unconsciousness or extinction, to which all mankind were doomed in consequence of the fall, is that great salvation which we have obtained through the blood of our Redeemer; and according to the theologians whose theory we are now considering, it was the only thing in the divine intention when the promise was given to the first mother that the seed of the woman should bruise head of the serpent. But though they contend that the death of Christ does not operate *directly* as an atonement for the *actual* sins of men, they admit that it does so *indirectly* and by necessary consequence, since it gives opportunities for repentance and newness of life, which under the first covenant they did not enjoy. Had a man under that covenant transgressed any moral precept, he would have forfeited the favour of his God, and either been subjected to punishment or to a long course of repentance; but supposing the efficacy of repentance under

(F) That by the words *creature* and *creation* the apostle here means all mankind, and by *vanity* and *corruption*, death, the reader will find proved by Dr Whitby, in his note on the place, with a strength of argument which cannot be shaken; and that the whole creation, the Gentiles as well as the Jews, groaned and travailed in pain together under the apprehension of death, is apparent from the writings of Cicero, who always seems doubtful whether death be a good or an evil; and from the lamentation of Hezekiah, when desired by the prophet to set his house in order because he should die and not live.

Theology more peculiarly Christian.

der the law of nature to be what they suppose it to be, he might before it was perfected have lost his existence by the eating of the forbidden fruit; and thus his penitence or punishment have ended in everlasting death. This can never be the issue of things under the new covenant, which, by the death of Christ, secures immortality to man, and gives to him opportunities, as long as he shall be in a state of probation, of recovering the divine favour when forfeited, whether by a moral transgression or a temporary violation of the peculiar condition of the covenant. Hence they admit the truth of the apostle's doctrine, that we are gainers by the fall of Adam and the redemption wrought by Christ; which will appear when we come to consider their notions of justification. In the mean time it may be proper to observe, that they consider it as no small confirmation of their opinion, that it tends to put an end to the long agitated disputes concerning the *extent* of redemption, and to reconcile passages of scripture which, on the commonly received theories both of Calvinists and Arminians, seem to be at variance with each other.

183 According to the Calvinists Christ died only for the elect.

It is well known to be one of the fundamental doctrines of the Calvinistic school, that "none are *redeemed* by Christ, effectually called, justified, adopted, sanctified, and saved, but the elect only *;" and if the notions of redemption, which, in the end of the 17th century, were very generally embraced, be admitted as just, it will not be easy to overturn the arguments by which that doctrine is supported. Such of them as are connected with the great question of election and reprobation, and enter into the decision of it, we have stated in another place (see PREDESTINATION, N° 14); but it is farther argued †, that the doctrine of *universal* redemption reflects on the wisdom, the justice, and the power of God, and robs him of his glory.

* *Confession of Faith of the Church of Scotland*, ch. iii. § 6.

† *Gill's Body of Divinity*, vol. ii. book 3. ch. 3.

The scriptures assure us that all men shall not be saved; but how can this be, if Christ died for all, and the scheme of salvation by his death was formed by infinite wisdom? The Arminians indeed say, that those who fail of salvation, fail through their own fault in not performing the conditions required of them; but God either *knew* or knew *not* that such men would not perform those conditions. If he knew it not, his knowledge is limited; if he did know it, where was his wisdom in providing a scheme of redemption for men to whom he was aware that it would be of no benefit? "God, we are told, is righteous in all his ways, and holy in all his works;" but there is no righteousness in making Christ bear the sins of *all* men, and suffer the punishment due to them, if any one of those men shall be afterwards punished everlastingly. If Christ has already paid the debts of the whole world, it cannot be just to cast a single inhabitant of the whole world into the prison of hell, there to be detained till he shall again have paid the uttermost farthing. "The Lord's hand is not shortened that it cannot save;" for he is and always will be the same Almighty power that he was from eternity; but if by the divine decree Christ died for all men, and yet all men shall not be saved, it would appear that man is mightier than his Maker! The ultimate end of God in the redemption of man is admitted to have been his own glory; but if any individual of the human race, who was redeemed by Christ, shall not be saved, God will so far lose his end, and be deprived of his glory. For, if this were the case, where would be the glory of God the Father in forming a scheme which, with respect to multitudes, does not succeed? and where would be the glory of the Son of God, the Redeemer, in working out the redemption of men who are yet not to be saved by him? and where would be the glory of the spirit of God, if redemption were not by him effectually applied to every individual for whom it was wrought? By such arguments as these do the Calvinists oppose the scheme of universal redemption, and contend that Christ died only for the *elect*, or such as shall be placed on his right hand at the day of judgement. This notion of a limited redemption, as they think it more worthy of the sovereignty of God, they believe to be taught by our Saviour himself, when he saith *, "All that the Father *giveth* me shall come to me; and him that cometh to me, I will in nowise cast out. For I came down from heaven, not to do mine own will, but the will of him that sent me. And this is the Father's will who hath sent me, that of all which he hath *given* me I should lose nothing, but should raise it up again at the last day."

Theology more peculiarly Christian.

* John vi. 37—40.

184 According to the Arminians he died for all men.

The Arminians, on the other hand, contend, that it is impious to limit the effects of Christ's death to a chosen few, since it appears from scripture, that by the decree and intention of his Father he tasted death for every man, that all, without exception, might through him obtain remission of their sins. Thus our Lord himself told Nicodemus †, that "as Moses lifted up the serpent in the wilderness, even so must the Son of Man be lifted up; that *whosoever* believeth in him, should not perish, but have everlasting life. For God so loved the *world*, that he gave his only begotten Son, that whosoever believeth in him should not perish, but have everlasting life. For God sent not his Son into the world to condemn the world, but that the *world* through him might be saved." In perfect conformity with the doctrine of his divine Master, St Paul teaches ‡, that "Christ died for *all*; that God was in Christ reconciling the *world* to himself, not imputing their trespasses unto them;" that "he will have *all* men to be saved, and to come unto the knowledge of the truth;" that "Christ gave himself a ransom for *all*;" and that "Jesus was made a little lower than the angels, that by the grace of God he should taste death for *every man*." The very same thing is taught by St Peter and St John, when the former says §, that "the Lord is not willing that *any* should perish, but that *all* should come to repentance;" and the latter ‖, that "Jesus Christ the righteous is the propitiation for our sins; and not for our's only, but for *the whole world*."

† John iii. 14—18.

‡ 2 Cor. v. 1—20. 1 Tim. ii. 4—7. Heb. ii. 9.

§ 2 Peter iii. 9.

‖ 1 John ii. 2.

On these texts, without any commentary, the Arminians are willing to rest their doctrine of universal redemption; though they think that a very strong additional argument for its truth arises from the numberless absurdities which flow from the contrary opinion. Thus, say they *, the apostles were commanded by our Saviour † to "go into *all* the world and preach the gospel to *every creature*," and all who hear it preached are required to believe it: but no man, as the Calvinists themselves confess, can believe the gospel as a Christian, without believing that Christ *died for him*; and therefore, if it be true that Christ died only for the *elect*, a great part of mankind are required to believe a lie, and a falsity is made the object of divine faith! Again, if Christ did not die for *all*, then no man can be sure that he

* *Limborch's Theologia Christiana*, Eng. Transl. book 4. ch. 3.

† St Mark xvi. 15, 16.

Theology more peculiarly Christian

he is bound to believe in Christ when preached to him; nor can any man be justly condemned for infidelity: which is not only absurd in itself, but directly contrary to what we are taught by our blessed Lord, who assures us *, that unbelief is the cause of condemnation. Lastly, if Christ died not for *all*, then is it certain that he cannot claim dominion *over all* in *consequence* of his *death* and *resurrection*; but S. Paul says expressly †, that "to *this end* Christ both *died*, and *rose*, and *revived*, that he might be the Lord both of the *dead* and *living*." The Arminians acknowledge, that though Christ died for all, there are many who will not be saved; for, say they ‡, the death of Christ did not literally pay the debts incurred by sinners, but only obtained for them the gracious covenant of the gospel, by which all who believe in him, and sincerely endeavour to work out their own salvation with fear and trembling, are entitled to forgiveness of sins and eternal life.

* St John iii. 18, 19, and 36.

† Rom. xiv. 9.

‡ *Wells's Div. Laws and Covenants*, part 2. ch. 3.

185 Difficulties removed by the modern Arminians.

Such is the state of this controversy as it was agitated between the Calvinists and Arminians of the 17th century; but the present leaders of this latter school are of opinion, that it never could have been started, had not both parties mistaken the purpose for which Christ died. It is not conceivable, say they, that any thing for which the eternal Son of God took upon him human nature, and in that nature suffered a cruel and ignominious death, shall not be fully accomplished; and therefore, if in the divine intention he died to make atonement for the sins of man actual as well as original, we must of necessity conclude, that those for whom he died shall certainly be saved. Yet we learn from scripture that many shall go away into everlasting punishment, though the same scripture repeatedly assures us that Christ gave his life a ransom for *all*, and that he is the propitiation for *the whole world*. To reconcile these different passages of scripture is impossible, if we suppose that he laid down his life to atone for the *actual* transgressions of men; but if the direct purpose of the Godhead in forming this stupendous plan of redemption was, that the death of Christ should be the ransom of all from the grave or utter extinction, every difficulty is removed; for we know that all, the wicked as well as the righteous, shall through him be raised to life at the last day. That this was the purpose for which he died, they think apparent from the very words quoted by the Calvinists to prove that redemption was not universal; for he declares that it was his Father's will, "that of all which had been given him he should lose nothing," *not* that he should save it all from *future punishment*, but only that he "should raise it up at the last day." When St John calls him a propitiation for our sins, which, as we have seen, the divines whose doctrine we are now stating hold him to be indirectly, he does not add, as in our translation, for the *sins* of the whole world, but περὶ ὅλου του κοσμου, for the whole world, which, by his death, he redeemed from that vanity and corruption under which, according to St Paul, it had groaned from the fall till the preaching of the gospel. Hence it is that our blessed Lord calls himself "the resurrection and the life," and always promises to those who should believe in him that though they were dead, yet should they live, and that he would raise them up at the last day.

Among these various opinions respecting the destination of the death of Christ, it belongs not to us to decide. The serious reader, divesting himself of prejudice in favour of the system in which he has been educated, will search the scriptures, and adopt the theory which he shall find most explicitly taught in that sacred volume; but as in every system it is admitted, that *one purpose* for which Christ died was to redeem mankind from the everlasting power of the grave, and bring to light life and immortality, it is of the utmost importance to know whether that purpose has been fully attained. Death we see still triumphing over all the generations of men; and as the scriptures give us no hopes of being rescued from its dominion but through the medium of a resurrection, some sensible evidence seems necessary to evince that a general resurrection shall actually take place. This we are promised as one great benefit purchased for us by the sufferings of Christ sacrificed on the cross. And since the price has been *paid*, and paid thus *visibly*, the nature of the covenant requires that the benefit should be as *visibly enjoyed* by the person whose sufferings obtained it for his brethren. "If the Redeemer himself had not been seen to enjoy the fruits of the redemption procured, what hopes could have remained for the rest of mankind? Would not the natural conclusion have been, that the expedient of *redemption*, by the death and sacrifice of Jesus, had proved ineffectual?" This is the conclusion which St Paul himself draws: "If Christ be not risen (says he *), then is our preaching vain, and your faith is also vain; ye are yet in your sins. Then they also, who are fallen asleep in Christ, are perished—απωλοντο—are lost, as if they had never existed. But now (adds he) is Christ risen from the dead, and become the first fruits of them that *slept*. For since by man came *death*, by man came also the *resurrection* of the dead: For as in Adam *all die*, even so in Christ shall *all be made alive*."—So necessarily connected, in the opinion of the apostle, is the resurrection of Christ with the very essence of Christianity †.

Theology more peculiarly Christian.

186 One purpose for which Christ died was to bring to light life and immortality.

* 1 Cor. xv. 15—23.

† *Warburton's Sermon on the Resurrection.*

We have in another place (see RESURRECTION, N° 50.) stated such arguments for the truth of this fundamental article of our common faith, as must carry conviction to every mind capable of estimating the force of evidence; we shall not here resume the subject.

Archbishop King has supposed ‡, that the human will is a faculty distinct from the understanding and the appetites; that activity is essential to it; and that previous to an election formed, it is equally indifferent to all objects. He thence infers, that a man may choose, and even take delight in, what is not naturally agreeable to any of his appetites; because when the choice is made, a relation is formed between the will and the object of choice, which, from being originally indifferent, now becomes a favourite object. But neither his Grace, nor any other asserter of human liberty, has ever affirmed or supposed, that any man or body of men could deliberately choose *evil* for its *own sake*, or enter zealously upon a tedious and difficult enterprise, from which *no good* could *possibly arise*, and from which *unmixed misery* was *clearly foreseen* as the *necessary result of every step of the progress*. Such, however, must have been the choice and the conduct of the apostles, when they resolved to preach a new religion founded on the resurrection of Jesus, if they did not certainly know that Jesus had risen from the dead. And this conduct must have been adopted, and, in opposition to every motive which can influence the human mind, have been persevered

‡ *Origin of Evil*, 4th edit. ch. v. sect. 1. subsect. 3. and 4.

Theology more peculiarly Christian.

vered in by a great number of men and women, without the ſmalleſt contradiction having ever appeared in the various teſtimonies, which at different times, and under the cruelleſt tortures, they all gave to a variety of circumſtances, of which not one had its foundation in truth. He who can admit this ſuppoſition, will not ſurely object to the incredibility of miracles. The reſurrection of a man from the dead is an event ſo different indeed from the common courſe of things, that nothing but the moſt complete evidence can make it an object of rational belief; but as the reſurrection of Jeſus has always been ſaid to have had God for its Author, it is an effect which does not exceed the power of the cauſe aſſigned, and is therefore an event poſſible in itſelf and capable of proof. It is a deviation from the laws of nature, but it is not contradictory to any one of thoſe laws.

That a great number of men and women ſhould deliberately form a plan of ruin and miſery to themſelves, without a proſpect of the ſmalleſt advantage either in this world or in the next, is as different from the common courſe of things as the reſurrection from the dead; and therefore in itſelf at leaſt as great a miracle: but that they ſhould perſiſt in proſecuting this plan in the midſt of torments; that they ſhould ſpread themſelves over the whole world, and everywhere publiſh a number of falſehoods, without any one of them contradicting the reſt; that truth ſhould never eſcape them either in an unguarded moment, or when lingering on the rack, and yet that all their lies ſhould be in perfect agreement with each other; that they ſhould every one of them court ſufferings for a perſon whom they knew to be an impoſtor; that not one of the number—not even a ſingle woman—ſhould have ſo much compaſſion for a fellow-creature, as to reſcue him from the flames by confeſſing a truth which could injure nobody—not even the ſuffering deceivers themſelves;—all this is not only different from the common courſe of things, but directly contrary to the moſt known laws of nature, and is therefore not miraculous, but may be pronounced impoſſible. Yet this impoſſibility we muſt admit, or acknowledge, that as Chriſt died for our ſins, according to the Scriptures, and was buried; ſo he roſe again the third day according to the Scriptures; that he was ſeen of Cephas, then of the twelve; after that of above five hundred brethren at once; after that of James; then of all the apoſtles; and that he was laſt of all ſeen of St Paul *, who was converted by the viſion to preach the faith which till then he had perſecuted.

* 1 Cor. xv. 3—9.

187 Hence we are aſſured of our own reſurrection.

Thus are we aſſured, that "thoſe who have fallen aſleep in Chriſt are not loſt, ſince he is riſen from the dead, and become the firſt fruits of them that ſlept. For ſince by man came death, by men came alſo the reſurrection of the dead. For as in Adam all die, even ſo in Chriſt ſhall all be made alive. But every man in his own order: Chriſt the firſt-fruits, afterwards they that are Chriſt's at his coming; for all that are in the graves ſhall hear his voice, and ſhall come forth; they that have done good unto the reſurrection of life, and they that have done evil to the reſurrection of damnation †."

† 1 Cor. xv. 20—24. and St John v. 28, 29.

Our bleſſed Lord having converſed familiarly with the eleven apoſtles for forty days after his reſurrection, inſtructing them in the things pertaining to the kingdom of God; having extended their authority as his miniſters, by giving them a commiſſion to teach all nations, and make them his diſciples, by baptizing them in the name of the Father, and of the Son, and of the Holy Ghoſt; and having promiſed them power from on high to enable them to diſcharge the duties of ſo laborious an office—led them out as far as Bethany, that they might be witneſſes of his aſcenſion into heaven. "When they therefore were come together, they aſked of him, ſaying, Lord, wilt thou at this time reſtore again the kingdom to Iſrael? And he ſaid, it is not for you to know the times and the ſeaſons, which the Father hath put in his own power. But ye ſhall receive power after that the Holy Ghoſt is come upon you; and ye ſhall be witneſſes unto me, both in Jeruſalem, and in all Judea, and in Samaria, and unto the uttermoſt parts of the earth. But tarry ye in the city of Jeruſalem, until ye be endued with power from on high; and he lift up his hands and bleſſed them; and it came to paſs while he bleſſed them, he was parted from them, and a cloud received him out of their ſight. And while they looked ſtedfaſtly towards heaven, as he went up, behold, two men ſtood by them in white apparel; who alſo ſaid, ye men of Galilee, why ſtand ye gazing up into heaven? This ſame Jeſus, who is taken up from you into heaven, ſhall ſo come, in like manner as ye have ſeen him go into heaven. And they worſhipped him, and returned to Jeruſalem with great joy *."

* St Luke xxiv. 49—53. and Acts i. 6—12.

188 Proofs of Chriſt's aſcenſion.

That our bleſſed Lord aſcended into heaven, will ſcarcely be denied in the preſent age by any one who admits that he roſe from the dead. The aſcenſion was indeed the natural conſequence of the reſurrection; for we cannot ſuppoſe that a man would be called back from the grave to live for ever in a world where all other men fall in ſucceſſion a prey to death. The purpoſe for which he died was to recover for the deſcendants of Adam every privilege which they had forfeited through his tranſgreſſion; and if, as has been generally believed, mankind were by the terms of the firſt covenant to enjoy eternal life in heaven, ſome proof was neceſſary that Chriſt by his death and reſurrection had opened the kingdom of heaven to all faithful obſervers of the terms of the ſecond. Hence it was prophesied † of the Meſſiah, in whom all the nations of the earth were to be bleſſed, that "he ſhould aſcend on high, lead captivity captive, and ſit on the right hand of God until his enemies ſhould be made his footſtool." It was therefore of the greateſt importance to the apoſtles to have ſufficient proof of their Maſter's exaltation to the right hand of the Majeſty on high; for otherwiſe they could neither have looked for an entrance into heaven themſelves, by a new and living way, as the author of the epiſtle to the Hebrews expreſſes it, nor have preached Jeſus as the Meſſiah promiſed to their fathers, ſince they could not have known that in him theſe prophecies were fulfilled. But the proof vouchſafed them was the moſt complete that the nature of the thing would bear. The ſpectators of the aſcenſion were many; for, according to the hiſtory of St Luke ‡, thoſe who returned from the Mount of Olives to Jeruſalem, and prepared themſelves for the coming of the Holy Ghoſt, were in number about ſix ſcore; and to ſuch a cloud of witneſſes the evangeliſt would not have appealed, had not the fact he was recording been very generally known. Yet theſe were perhaps but part of the witneſſes; for ſince

† Pſ. lxviii. 18. cx. 1. Micah ii. 13.

‡ Acts i. 12—16.

Theology more peculiarly Christian.

since Christ had told to his disciples that he was to ascend to his Father and their Father, to his God and their God, and that he was going to prepare a place for them, that where he is there they might be likewise; we can hardly doubt but that all who believed in him as the Redeemer of the world would take care to be present, not only to view their Master's triumph over all his enemies, but also to have a sight of that glory which awaited themselves. It was on this occasion probably that he was seen after his resurrection by above five hundred brethren at once, of whom the greater part were alive at the writing of St Paul's first epistle to the Corinthians.

But though such multitudes of people saw Jesus lifted up from the mount, and gradually vanish out of their sight, some other evidence seemed necessary to certify them of the place to which he had gone. Two angels therefore appear, and attest what human eyes could not see, but what was indeed the consequence of what they had seen. They attest that Christ had ascended to heaven, not to descend again till the last day; and surely, with respect to this point, the citizens of heaven were the most unexceptionable witnesses. We must therefore acknowledge and confess, against all the wild heresies of old (K), that Jesus Christ the Son of God, who died and rose again, did with the same body and soul with which he had lived upon earth ascend up "into heaven, there to appear in the presence of God for us *." Having in the outward tabernacle of this world once offered up himself a pure and perfect sacrifice for the expiation of our sins, he entered within the veil into the most holy place, there to present his blood before God himself, in order to obtain mercy for us, and restore us to the Divine favour. So that, "if any man sin, we have an advocate with the Father, Jesus Christ the righteous, who is the propitiation for our sins, and not for ours only, but also for the sins of the whole world; and he is able to save to the uttermost those that come to God by him, seeing he ever liveth to make intercession for us." "Seeing then that we have a great high-priest, who is passed into the heavens, Jesus the Son of God, we may through him come boldly unto the throne of grace, that we may obtain mercy, and find grace to help in time of need."

* Heb. ix. 24.

189 In heaven our Saviour executes the office of a priest

190 and a king.

But it is not the office of a priest only that our Lord discharges in heaven; he is represented as sitting on the right hand of God. to denote that regal authority with which he is now vested; "angels, and authorities, and powers, being made subject to him †." Hence it is, that after his resurrection, he said of himself ‡, "all power is given unto me in heaven and in earth;" for, as St Paul informs us §, "because he humbled himself and became obedient unto death, even the death of the cross, therefore God hath highly exalted him, and given him a name which is above every name: that at the name of Jesus every knee should bow, of things in heaven, and things in earth, and things under the earth." And this submission is due to him, because "God raised him from the dead, and set him at his own right hand in the heavenly places, far above all principalities and powers, and might, and dominion, and every name that is named, not only in this world, but also in that which is to come; and hath put all things under his feet, and gave him to be head over all things to the church *." As God, Christ possessed a kingdom, which, as it had not a beginning, can never have an end: but the dominion, of which the apostle is here treating, was conferred upon him as the mediator of the new covenant, and will no longer continue than till his enemies shall be subdued; for we are told, that "he must reign till he hath put all enemies under his feet; and that the last enemy which shall be destroyed is death." "He will ransom his subjects from the power of the grave; he will redeem them from death. O death, he will be thy plague; O grave, he will be thy destruction †.' The trumpet shall sound, the graves shall be opened, all the sons and daughters of Adam shall return to life, and death shall be swallowed up in victory. "Then cometh the end, when the office of mediator ceasing, he shall have delivered up the kingdom to God, even the Father, when he shall have put down all rule and all authority and power. For when all things shall be subdued unto him, then shall the Son also himself be subject unto him that put all things under him, that God may be all in all ‡."

† 1 Peter iii. 22.
‡ Matth. xxviii. 18.
§ Phil. ii. 8, 9, 10.

Theology more peculiarly Christian.

* Eph. i. 20, &c.

† Hosea xiii. 14.

‡ 1 Cor. xv. 24—28.

191 Descent of the Holy Ghost on the apostles.

The first conspicuous proof which our blessed Lord gave of being vested with supreme power, and made head over all things to the church, was on the day of Pentecost. He had told the apostles that he would pray the Father to give them another comforter, who should abide with them for ever, even the Spirit of truth, which should teach them all things, and bring all things to their remembrance which he had said unto them. He had assured them, that it was expedient for them that he himself should go away; "for if I go not away (said he *), the Comforter will not come unto you; but if I depart, I will send him unto you." At his last interview with them, just before his ascension, he had desired them to tarry at Jerusalem till they should be endued with power from on high, before they entered upon their great work of converting the nations. These promises were amply fulfilled; for "when the day of Pentecost was fully come, they were all with one accord in one place. And suddenly there came a sound from heaven as of a rushing mighty wind, and it filled all the house where they were sitting. And there appeared unto them cloven tongues, like as of fire, and it sat upon each of them. And they were all filled with the Holy Ghost, and began to speak with other tongues, as the Spirit gave them utterance. And there were dwelling

* John xvi. 7.

(H) There was one Apelles in the primitive church, who was condemned as a heretic for teaching that Christ's body was dissolved in the air, and that he ascended to heaven without it. The opinions of this man and his followers are stated at large and confuted by Tertullian, Gregory Nazianzen, and Epiphanius; and the reader who thinks such ridiculous notions worthy of his notice, will find enough said of them in the Notes to the sixth article of Pearson's Exposition of the Creed. Perhaps it may be from a hint communicated in these Notes, that our great modern corrector of the evangelists has discovered, if it be indeed true that he pretends to have discovered, that Jesus Christ is still upon earth.

Theology more peculiarly Christian.

dwelling at Jerusalem Jews, devout men, out of every nation under heaven. Now when this was noised abroad, the multitude came together, and were confounded, because that every man heard them speak in his own language. And they were all amazed, and marvelled, saying one to another, Behold, are not all these who speak Galileans? And how hear we every man in our own tongue, wherein we were born? Parthians, and Medes, and Elamites, and the dwellers in Mesopotamia, and in Judea, and Cappadocia, in Pontus and Asia, Phrygia and Pamphylia, in Egypt and in the parts of Libya about Cyrene, and strangers of Rome, Jews and proselytes, Cretes and Arabians—we do hear them speak in our tongues the wonderful works of God. And they were all amazed, and were in doubt, saying one to another, What meaneth this † ?"

† Acts ii. 1—13.

192 Certainty of that miracle.

That those who heard the apostles speak so many different languages were amazed, is what we should naturally suppose; but that a single individual among them remained unconvinced, is astonishing? for the gift of tongues on the day of Pentecost is one of the most palpable miracles that was ever wrought. It is likewise one of the best authenticated miracles; for the book entitled *the Acts of the Apostles* was written not more than 30 years after the event took place (see SCRIPTURE, N° 168.); and it is not conceivable that, within so short a period, St Luke, or any man of common sense, would have appealed for the truth of what he recorded to so many inveterate enemies of the Christian name, had he not been aware that the miraculous gift of tongues was a fact incontrovertible. We all know how desirous the Jewish rulers were to stop the progress of the faith, by whatever means; but if this miracle was not really performed, they had now an opportunity of doing it effectually by means to which truth and honour would give their approbation. Thousands must have been alive in the city of Jerusalem who were men and women at the time when the apostles were said to have been thus suddenly inspired with the tongues of the Parthians, Medes, and Elamites, &c.; and as these foreigners were themselves either Jews by descent, or at least proselytes to the Jewish religion, surely the chief-priests would have found multitudes ready, both at home and abroad, to contradict this confident appeal of St Luke's if contradiction had been possible. We read however of no objection whatever being made to this miracle. Some of the audience, indeed, when the apostles addressed people of so many nations in all their respective languages, not understanding what was said, and taking it for jargon which had no meaning, concluded, not unnaturally, that the speakers were full of new wine, and mocked them for being drunk so early in the day; but this is a circumstance which, so far from rendering the miracle doubtful, adds much to the credit of the historian, as it would hardly have occurred to the writer of a narrative wholly false, and would certainly not have been mentioned, had he known that the apostles really attempted to impose on the multitude unmeaning sounds for foreign languages.

193 The gift of tongues permanent with the apostles.

As it is thus certain that the apostles were miraculously furnished with the gift of tongues, so the elegance and propriety of that miracle to attest the real descent of the Spirit of truth, who was to teach them all things, and endue them with power from on high to convert the nations, can never be enough admired by the pious Christian; for words being the vehicle of knowledge, an ability to speak the different languages of the earth was absolutely necessary to enable those who had been originally fishermen to go into all the world and preach the gospel to every creature. Yet there have been writers *, who, though unable to call in question the reality of the gift of tongues on the day of Pentecost, have contended, that it was a gift "not lasting, but instantaneous and transitory; not bestowed upon them for the constant work of the ministry, but as an occasional sign only, that the person endowed with it was a chosen minister of the gospel; which sign, according to them, ceased and totally vanished as soon as it had served that particular purpose." The chief argument upon which this opinion is attempted to be built, is drawn from the scripture Greek, which is said to be "utterly rude and barbarous, and abounding with every fault which can possibly deform a language; whereas we should naturally expect to find an inspired language pure, clear, noble, and affecting, even beyond the force of common speech; since nothing can come from God but what is perfect in its kind. In short, we should expect, says the objecter, the purity of Plato and the eloquence of Cicero †."

Theology more peculiarly Christian.

* *Dr Middleton* and *Lord Shaftesbury.*

194 Objections.

† *Middleton's Essay on the Gift of Tongues.*

In reply to this objection, it has been well observed ‡, that it supposes what is called the purity, elegance, and sublimity, of language, to be something natural and essential to human speech, and inherent in the constitution of things. "But the matter is far otherwise. These qualities are accidental and arbitrary, and depend on custom and fashion; modes of humanity as various as the differing climes of the earth; and as inconstant as the tempers, genius, and circumstances, of its inhabitants. For what is *purity*, but the use of such terms and their combinations as the caprice of a writer or speaker of authority hath preferred to their equals? what is *elegance*, but such a turn of idiom as a fashionable fancy hath brought into credit? and what is *sublimity*, but the application of such images as arbitrary and casual connections, rather than their own native grandeur, have dignified and ennobled? The consequence of this is, that the mode of composition which is a model of perfection to one nation or people, has always appeared either extravagant or mean to another. Asiatic and Indian eloquence was esteemed hyperbolical and unnatural by the Greeks and Romans, and is so esteemed by us; whilst the Greek and Roman eloquence in its turn appeared cold and insipid to the warm inhabitants of the east; and ours would appear perhaps still colder. But the New Testament was designed for the rule of life to all mankind. Such a rule required inspiration; and inspiration, say the objecters, implies the most perfect eloquence. What human model then was the Holy Ghost to follow? for a human model it must have been, because there was no other; and if there had, no other would have answered the purpose, which was to make a due impression on the mind and affections. Should the eastern eloquence have been employed? But it would have been too swelling and animated for the west. Should the western? This would have been too still and inactive for the east. Or suppose us only solicitous for what we best understand; which species of this latter genus should the sacred writers have preferred? The dissolute softness of the Asiatic Greeks, or the dry conciseness of the Spartans? The flowing exuberances

‡ *Warburton's Doctrine of Grace.*

195 Answered.

Theology more peculiarly Christian.

uberances of Attic eloquence, or the grave severity of the Roman?

"But are there not some general principles of eloquence in common to all the species? There are. Why then should not these have been employed to credit the apostolic inspiration? Because the end even of these (replies our author), is to mislead reason, and inflame the passions; which being abhorrent to the truth and purity of our holy religion, were very fitly rejected by the inspired penman. Besides, it might easily be known to have been the purpose of Providence, though such purpose had not been expresly declared, that the gospel should bear all possible marks of its divine original, as well in the course of its progress as in the circumstances of its promulgation. To this end, the human instruments of its conveyance were mean and illiterate, and chosen from among the lowest of the people, that when the world saw itself converted by the *foolishness of preaching*, as the only learned apostle thinks fit to call it, unbelievers might have no pretence to ascribe its success to the parts, or stations, or authority, of the preachers. Now had the language inspired into these illiterate men been the eloquence of Plato or Tully, Providence would have appeared to counteract its own measures, and to defeat the purpose best calculated to advance its glory. But God is wise, though man is a fool. The course of Providence was uniform and constant: It not only chose the weakest instruments, but carefully kept out of their hands that powerful weapon of WORDS which their adversaries might so easily have wrested to the dishonour of the gospel. Common sense tells us, that the style of an universal law should retain what is common to all languages, and neglect what is peculiar to each. It should retain nothing but CLEARNESS and PRECISION, by which the mind and sentiments of the writer are intelligibly conveyed to the reader. This quality is essential, invariably the same, and independent of custom and fashion. It is the consequence of syntax, the very thing in language which is least positive, as being formed on the principles of philosophy and logic: whereas all besides, from the very power of the elements and signification of the terms to the tropes and figures in composition, are arbitrary; and, as deviating from these principles, frequently vicious. But this quality of clearness and precision eminently distinguishes the writings of the New Testament; insomuch that it may be easily shown, that whatever difficulties occur in the sacred books do not arise from any imperfect information caused by this local or nominal barbarity of style; but either from the sublime or obscure nature of the things treated of, or from the intentional conciseness of the writers; who, in the casual mention of any thing not essential to the dispensation, always observe a studied brevity."

After much ingenious and sound reasoning on the nature of language in general, our author concludes, that the STYLE of the New Testament, even on the truth of what has been said to its discredit, is so far from proving the language not to be divinely inspired, that it bears one certain mark of that original. "Every language consists of two distinct parts, the single terms, and the phrases and idioms. Suppose now a foreign language to be instantaneously introduced into the minds of illiterate men like the apostles; the impression must be made either by fixing in the memory the terms and single words only with their signification, as, for instance, Greek words corresponding to such or such Syriac or Hebrew words; or else, together with that simple impression, by enriching the mind with all the phrases and idioms of the language so inspired. But to enrich the mind with the peculiar phrases and idiom of a foreign language, would require a previous impression to be made of the manners, notions, fashions, and opinions, of the people to whom that language is native; because the idiom and phrases arise from and are dependent on these manners. But this would be a waste of miracles without sufficient cause or occasion; for the Syriac or Hebrew idiom, to which the Jews were of themselves enabled to adapt the Greek or any other words, abundantly served the useful purposes of the gift of tongues, which all centered in those tongues, being so spoken and written as to be CLEARLY UNDERSTOOD. Hence it follows, that if the style of the New Testament were indeed derived from that language which was miraculously impressed upon the apostles on the day of Pentecost, it must be just such a one as in reality we find it to be; that is, it must consist of Greek words in the Syriac or Hebrew idiom."

Theology more peculiarly Christian.

196 Divinity of the Holy Ghost.

The immediate author of this gift, so necessary to the propagation of the gospel, was the Spirit of truth, or the Comforter, who is the Holy Ghost and the third person in the blessed Trinity. That there are three persons in the one Godhead, has been shewn at large in a former section of this article; and that the Holy Ghost is one of these three, might be safely concluded from the form of baptism instituted by Christ himself. But as more plausible objections have been urged against his divinity than any that we have met with against the divinity of Christ, it may not be improper to consider these before we proceed to give an account of the graces which he imparted to the infant church, and of the apostles preaching under his influence. By the Arians the Holy Ghost is considered as a creature; by the Socinians and modern Unitarians, as they call themselves, the words *Holy Ghost* are supposed to express, not a person or spiritual subsistence, but merely an energy or operation, a quality or power, of the Father, whom alone they acknowledge to be God. If this doctrine can be confuted, the Arian hypothesis will fall to the ground of itself; for it is not conceivable than any inspired teacher should command his followers to be baptized in the name of the self-existent God and two creatures.

197 Objections.

It is admitted by the Socinians themselves, that in the Scriptures many things are spoken of the Holy Ghost which can be properly predicated only of a person; but the inference drawn from this concession they endeavour to invalidate by observing, that in scripture there are likewise expressions in which things are predicated of abstract virtues, which can be literally true only of such persons as practise these virtues. Thus when St Paul says *, that "charity suffereth long and is kind, charity envieth not, charity vaunteth not itself, is not puffed up, &c." we cannot suppose his meaning to be, that these actions are performed by charity in the abstract, but that every charitable person, in consequence of that one Christian grace, suffereth long and is kind, envieth not, vaunteth not himself, and is not puffed up, &c. In like manner, say they, personal actions are attributed to the Holy Ghost, which itself is

* 1 Cor. xiii. 4—8.

Theology more peculiarly Christian.

no person, but only the virtue, power, or efficacy, of God the Father; because God the Father, who is a person, performs such actions by that power, virtue, or efficacy, in himself, which is denominated the Holy Ghost. Thus when we read * that "the Spirit said unto Peter, Behold three men seek thee; arise therefore and get thee down, and go with them, doubting nothing, for I have sent them;" we must understand that God the Father was the person who spoke these words and sent the three men; but because he did so by that virtue in him which is called the *Spirit*, therefore the *Spirit* is said to have spoken the words and sent the men. Again, when "the Holy Ghost said † to those at Antioch, Separate me Barnabas and Saul for the work whereunto I have called them;" we are to conceive that it was God the Father who commanded the two apostles to be separated for the work to which he had called them; but because he had done all this by that power within him which is called the Holy Ghost, therefore his words and actions are attributed to the Holy Ghost, just as long-suffering in men is attributed to charity.

* Acts x. 19, 20.

† Acts xiii. 2.

198 Answered.

This reasoning has a plausible appearance, and would be of much force were *all* the actions which in scripture are attributed to the Holy Ghost of such a nature as that they could be supposed to have proceeded from the person of God the Father in consequence of any particular power or virtue in him; but this is far from being the case. Thus "Spirit is said ‡ to make intercession for us;" but with whom can we suppose God the Father, the fountain of divinity, to intercede? Our Saviour assured § his disciples, that the Father would, in his name, send to them the Holy Ghost, who is the Comforter; that he would himself send the Comforter unto them from the Father; that the Comforter should not speak of himself, but speak only what he should hear; and that he should receive of Christ's, and shew it unto them. But we cannot, without blasphemy and absurdity, suppose that the Father would, in the name of Christ, send himself; that the Son would send the Father from the Father; and the Father would not speak of himself, but speak only what he heard; or that either the Father in person, or a quality of the Father, should receive any thing of Christ to shew unto the apostles.

‡ Rom. viii. 26, 27.

§ St John xiv 26. xv 26. xvi. 13, 14, 15.

The sagacity of Socinus perceived the force of such objections as these to his notion of the Holy Ghost, being nothing more than the power of the Father personified; and therefore he invented another *prosopopeia* to serve his purpose in the interpretation of those texts to which this one cannot be applied. "The Spirit of God (says he ‖) may be considered either as a property or power in God, or as the things on which that power is working. When taken in the former sense, the Spirit, where any personal attribute is given to it, means God the Father; when taken in the latter sense, it means the man on whom the power of the Father is working; who, as long as he is affected by that power, is therefore called the Spirit of God;" and he quotes, we think most absurdly, the tenth verse of the second chapter of the first epistle to the Corinthians, as a text in which by the Spirit is meant an inspired man who could search all things, yea, even THE DEEP THINGS OF GOD.

‖ *Faust. Socinus in Refut. ad Wickam*, cap. 10.

How his modern followers, who deny the plenary inspiration even of Christ, will relish such a degree of inspiration as this, which raises mere men to a temporary equality with God, we know not; but leaving them to settle the dispute with their master, we shall produce one or two passages in which personal attributes are given to the Spirit of God, when it is impossible to conceive that Spirit, either as a power inherent in the Divine Father, or as the person on whom that power is operating. We need not bring new texts into view, as some of those already quoted will serve our purpose. When our Saviour promises that the *Holy Ghost*, *the Comforter*, *the Spirit of truth*, should be sent by the Father and the Son to the apostles, we have seen, that by this Spirit he could not mean the Father or a property of the Father; neither could he possibly mean the apostles themselves, unless we are to suppose that the Father and the Son sent St Peter to St Peter, and that St Peter, so sent, came to St Peter! Again, when Christ saith of the Holy Ghost, "he shall receive of mine, and shall shew it unto you," he could not, for the reason already assigned, mean by the Holy Ghost the Father or the power of the Father; and surely his meaning was not, that the apostles, under the influence of the power of the Father, should receive something and shew it each to himself! The Holy Ghost therefore is unquestionably a person; for though there are many passages of scripture in which the *gifts* of the Holy Ghost are called the *Holy Ghost*, they are so called by a very common figure of speech, in which the effect receives the name of its cause: and since this person is joined with the Father and the Son in the formula of Christian baptism; since they who lied to the Holy Ghost are said * to have lied unto God; since blasphemy against him is a more heinous offence than the same sin against even the Father or the Son †; and since it was by the operation of the Holy Ghost that Jesus Christ was conceived of the Virgin Mary, and even on that account called the ‡ Son of God—it follows that the Holy Ghost is God, of the same substance with the Father and Son.

* Acts v. 4.

† Mark iii. 28, 29.

‡ Luke i. 35.

199 The apostles miraculously instructed in the principles of religion.

It was this Divine Spirit which, on the day of Pentecost, inspired the apostles with the knowledge of different languages; and as these were given only to enable them to preach the gospel to every creature, it can admit of no doubt but that he, who so amply provided the means of preaching, would take care that the gospel should be preached in purity. Our Saviour had told his apostles, that the Comforter would guide them into all the truth (εις πασαν την αληθειαν), and bring all things to their remembrance, whatsoever he had said unto them; but if they had not comprehended the meaning of what he said, the bare remembrance of his sayings would have been of little importance. That before this miraculous shedding abroad of the Spirit they had but a very imperfect knowledge of his doctrines, and of the purpose for which he had come into the world, is apparent from that unseasonable question which they put to him when assembled to witness his glorious ascension; "Lord, wilt thou at this time restore again the kingdom to Israel?"

200 Their great need of such instruction.

Their minds still cherished with fondness the vain prospect of temporal power; but after the day of Pentecost they were directed to nobler objects. From the same Spirit they received diversities of gifts besides that of language: for we are assured by St Paul *, when speaking of the early converts to Christianity in general,

* 1 Cor. xii. 8—12.

Theology more peculiarly Christian.

ral, that "to one was given by the Spirit the word of WISDOM; to another the word of KNOWLEDGE by the same Spirit; to another FAITH by the same Spirit; to another the gifts of HEALING by the same Spirit; to another the working of MIRACLES; to another PROPHECY; to another DISCERNING OF SPIRITS; to another DIVERS KINDS of TONGUES; to another the INTERPRETATION OF TONGUES." and these gifts, which were severally divided either among private Christians or among the inferior orders of ministers in the church, we have reason to believe were all bestowed in a greater or less degree upon each of the apostles.

Men thus endowed were well qualified to declare unto the world all the council of God. By the word of *wisdom* they communicated to the Gentile nations a pure system of what is called *natural religion;* turning them from the vanity of idols to the worship of the living God: by the word of *knowledge*, they preached the great doctrines of revelation both to Jews and Gentiles, shewing them that there is none other name under heaven given unto men whereby they may be saved than the name of Jesus Christ (L); and by their gifts of *healing* and of *miracles*, &c.; they were enabled to prove unanswerably, that their doctrines were divine. They taught everywhere the unity of God, the creation of the world, the fall of man, the necessity of redemption, the divinity of the Redeemer, his sacrifice on the cross to restore mankind to their forfeited immortality, and the terms of the new covenant into which they had through him been graciously admitted by God.

Such a view as our limits would admit of we have given of all these doctrines, except that which respects the terms of the gospel covenant; but these being explicitly stated only by St Paul and St James, we could not till now investigate them, without violating the historical order into which, for the sake of perspicuity, we have digested the several parts of this short system. Our Saviour himself has indeed taught with great plainness the necessity of faith and baptism to the salvation of those who have an opportunity of hearing the gospel preached with power (see BAPTISM) and in his sermon on the mount, which is such a lecture of ethics founded on religion as the Son of God only could have delivered, we learn, that "unless our righteousness shall exceed the righteousness of the Scribes and Pharisees, we shall in no case enter into the kingdom of heaven; that not every one who saith unto Christ, Lord, Lord, shall enter into the kingdom of heaven, but he who doth the will of the Father who is in heaven; and that many will say to him at the day of judgement, Lord, Lord, have we not prophesied in thy name, and in thy name done many wonderful works?" which could not be done without faith; to whom he will, notwithstanding, say, "Depart from me, ye that work iniquity *." St Paul, however, seems to attribute our justification to the bare act of believing; for he repeatedly assures us, "that a man is justified by faith without the deeds of the law;" while St James, on the other hand, affirms, "that by works a man is justified, and not by faith only." This apparent difference in the language of the two apostles, has produced among divines opinions really different respecting the justification of Christians; and the principal of these opinions it is our duty to state.

Theology more peculiarly Christian.

* St Matth. v. 20. vii 21.—24.

201 Meaning of justification.

Between *pardon* of sin and *justification* there is so close a connection, that many writers seem to consider the terms as synonymous, and to infer, that he who is pardoned is *ipso facto* justified. That every Christian, who shall be pardoned at the judgement of the great day, will likewise be justified, is indeed true; but in propriety of speech, *justification* is a word of very different import from *pardon*, and will entitle the Christian to what mere pardon could not lead him to expect. An innocent person, when falsely accused and acquitted, is *justified* but not *pardoned;* and a criminal may be *pardoned*, though he cannot be *justified* or declared innocent. A man whose sins are pardoned is free from punishment; but the justified Christian is entitled to everlasting life, happiness, and glory. If we were only pardoned through Christ, we should indeed escape the pains of hell, but could have no claim to the enjoyments of heaven; for these, being more than the most perfect human virtue can merit, must be, what in the scriptures they are always said to be, "the gift of God through Jesus Christ our Lord." Hence it is that St Paul, distinguishing, as we have done upon his authority, between mere remission of sins and justification of life, declares †, that "Jesus our Lord was *delivered* for our *offences*, and *raised* again for our *justification*."

† Romans iv. 25.

The word justification, as used both by St Paul and St James, has been very generally considered as a forensic term expressing the sentence of a judge. The most eminent reformed divines of all denominations ‡, and even many of the Romanists themselves, have strenuously contended, that this is its genuine sense, when it is distinguished from mere remission of sins, regeneration, and sanctification; and if so, it will signify God's pronouncing a person *just*, either as being perfectly blameless, or as having fulfilled certain conditions required of him in the Christian covenant. But that "there is not a just man upon earth, who doth good and sinneth not," is made known to us by the most complete evidence possible, the joint dictates of our own consciences and of divine

‡ *Limborch, Bull, Waterland, Warburton, Beveridge, Vitringa, Gill*, &c.

(L) It is not perhaps easy to determine what is here meant by the word of WISDOM and the word of KNOWLEDGE, as distinguished from each other. By the former (λογος σοφιας), Bishop Warburton understands all the great principles of natural religion. "The ancients (says he) used the word σοφια in this peculiar sense; it is used in the same sense by St Paul in Col. iv. 5.; and we can hardly give it any other in the place before us, where we see the word of wisdom distinguished from the word of knowledge (λογος γνωσεως), which evidently means all the great principles of revelation; the term γνωσις being as peculiarly applied by Christian writers to revealed religion as σοφια is by the Gentiles to the natural. St Paul uses the word in this sense in 2 Cor. xi. 6. where he says, Ει δι και ιδιοτης τω λογω αλλου τη γνωσει; and St Peter in his first epistle, chap. iii. verse 7. Hence those early heretics who so much deformed the simplicity and purity of the Christian faith by visionary pretences to superior knowledge of revelation, took from this word the name of Gnostics." See *Warburton's Sermon on the Office and Operation of the Holy Ghost.*

Theology more peculiarly Christian.

divine revelation; and therefore whosoever is pronounced just by the Judge of all the earth, must be so, either because, though not absolutely blameless, he has performed the conditions required of him in the covenant of grace, or because Christ has fulfilled all righteousness in his stead.

202 It is a forensic term.

If this be the Scripture notion of justification, it must be wholly the act of God, and cannot be the effect either of our faith or of our virtue. Accordingly, we are said by the apostle to be justified freely by his grace through the redemption that is in Jesus Christ; whom *God hath set forth* to be a propitiation through faith in his blood *. The act of justification therefore proceeds from the divine philanthropy, and cannot be performed by the instrumentality of faith; for it is not God, but man, who believes; and man is not the justifier of himself. To talk of any kind of *instrument* of justification besides the propitiation set forth by God, is indeed to make use of very improper language: "Omnis causa instrumentalis (says Bishop Bull †), suo modo in effectum influit, eique effecti productio propriè attribui potest. Jam vero, cum justificatio nihil aliud sit quam gratiosus Dei actus, quo peccata nostra nobis condonet, ac nos ad salutem acceptet, valde absurdum esset dicere, vel fidem, vel opera nostra, vel quidvis aliud nostri aut remittere peccata nostra, aut personas nostras acceptare: quod tamen, si instrumentalis causa justificationis fides sit, planè dicendum esset."

* Rom. iii. 24, 25.

† *Harmonia Apostolica*, cap. ii. § 9.

In this sentiment of the bishop of St David's some of the most eminent divines both among the Calvinists and Arminians agree. Many, however, have chosen to treat of justification not only in the active sense, as it is the act of God, for all admit that it is he who justifies; but likewise in a passive sense, as it means our *privilege* or *possession* holden of him, when we are said to be justified by his grace. In this view of the subject they may talk, with sufficient propriety, of an instrument of justification, not as the mean by which it is conveyed, but as the medium through which it is received by the true Christian. And hence it follows, that Waterland and Warburton strenuously maintain the doctrine of the Westminster Confession, "that faith receiving and resting on Christ is the alone instrument of justification; though it cannot be alone in the person justified, but must ever be accompanied with all other saving graces, and be a faith which worketh by love."

But notwithstanding this agreement between the leaders of the rival sects, they have found abundant matter of controversy respecting faith and works, in deciding the great question, "Whether, when God justifies man, he considers him as absolutely righteous on account of Christ's righteousess performed in his stead; or only as just, because he has fulfilled the conditions of the covenant of grace, which does not require of him perfect righteousness?" The former is the doctrine of the more rigid Calvinists, the latter that of the Arminians or Remonstrants.

"A notion (says Dr Gill ‡) obtained some years ago, that a relaxation of the law and the severities of it has been obtained by Christ; and a new law, a remedial law, a law of milder terms, been introduced by him, which is the gospel; the terms of which are, faith, repentance, and new obedience; and though these be imperfect, yet, being sincere, they are accepted by God in the room of perfect righteousness. But every article of this scheme (continues he) is wrong; for the law is not relaxed, nor any of its severities abated; Christ came not to destroy, but to fulfil it; and therefore it requires the same holy, just, and good things, as ever. Nor is the gospel a new law. There is nothing in it (he says) which looks like a law; for it has no commands in it, but all promises, being a pure declaration of grace and salvation by Christ; nor are faith, repentance, and a new obedience, required by it as conditions of man's acceptance with God. Faith and repentance are gospel doctrines, and parts of the gospel ministry; they are graces, and not terms required to be performed by men of themselves. Faith is the gift of God, and repentance is a grant from him. It is not true (continues our author) that God will accept of an imperfect righteousness in the room of a perfect one; nor can any thing more highly reflect upon the justice and truth of God, who is the judge of all the earth, than to suppose that he can ever account that as a righteousness which is not one."

‡ *Body of Divinity*, vol. ii. book iii. chap. 8. § 5.

Theology more peculiarly Christian.

203 Doctrine of the Calvinists respecting it.

Having thus proved by arguments which were almost in the same words stated long before by Bishop Beveridge *, that the gospel is no relaxation of the law, he proceeds to lay down his own notions of justification, of which (he says) "the sole matter, or that for the sake of which a sinner is justified before God, is the righteousness of Christ—that which he did and suffered on earth, in our nature, in our stead, and as our representative. This is commonly called his active and passive obedience; and when the purity and holiness of his own nature was added to it, the whole made up the δικαιωμα του νομου, *the righteousness of the law*, which was fulfilled by him as the head and representative of his people †; for whatever the law required is necessary to a sinner's justification before God, and it required of sinners more than it did of man in innocence. Man was created with a pure and holy nature, conformable to the pure and holy law of God; and it was incumbent on him to continue so, and to yield in it perfect and sinless obedience, in the failure whereof he was threatened with death. Man did fail, by which his nature was vitiated and corrupted, and his obedience became faulty and imperfect. He therefore became liable to the penalty of the law, and still perfect obedience was required of him. To the justification of a sinner therefore is required the most complete obedience, active and passive; or, in other words, purity of nature, perfect obedience, and the sufferings of death; all which meet in Christ, the representative of his people, in whom they are justified. There are indeed some divines (continues our author) who exclude the active obedience of Christ from being any part of the righteousness by which men are justified. They allow it to have been a condition requisite in him as a Mediator, qualifying him for his office; but deny that it is the matter of justification, or reckoned for righteousness to man. But without the active obedience of Christ the law would not be satisfied; the language of which is, *Do and live;* and unless its precepts be obeyed, as well as its penalty endured, it cannot be satisfied; and unless it be satisfied, there can be no justification. If therefore men are justified by the righteousness of Christ, it must be by his active obedience imputed and made over to them, so as to become their's, *even as David describeth the blessedness of the man unto whom God imputeth righteousness without works* ‡. That this is really the way in which men are justified, our author thinks evident,

* See his *Private Thoughts of Religion.*

† Rom. viii. 4.

‡ Rom. iv. 6.

Theology more peculiarly Christian.

evident, because they must be justified either by an inherent or by an imputed righteousness; but they cannot be justified by their own inherent righteousness, for that is imperfect, and therefore not justifying. Hence the apostle 'counts all things but dung, that he may win Christ and be found in him; not having his own righteousness, which is of the law, but that which is *through the faith of Christ*, the righteousness which is of *God by faith* *.' But by such a righteousness as this a man cannot be justified in any other way than by an imputation of it to him. Whence it follows, that '*as by one man's disobedience many were made sinners* by imputation, so *by the obedience of one shall many be made* righteous, by having that obedience placed to their own account."

* Philip. iii. 8, 9.

As this author properly considers justification as the act of God, he does not approve of the language in which faith is called the instrument either of conferring or receiving it. "Faith (says he †) is merely the evidence of justification to the person justified; for 'faith is the evidence of things not seen.' The righteousness of God, of the God-man and Mediator Jesus Christ, is revealed from faith to faith in the everlasting gospel ‡; and therefore must be before it is revealed, and before the faith to which it is revealed. Faith is that grace whereby a soul, having seen its want of righteousness, beholds in the light of the Divine Spirit a complete righteousness in Christ, renounces its own, lays hold on that, puts it on as a garment, rejoices in it, and glories of it; the Spirit of God witnessing to his spirit that he is a justified person: and so he is evidently and declaratively 'justified in the name of the Lord Jesus, and by the spirit of our God ‖'. Faith adds nothing to the *esse*, only to the *bene esse* of justification; which is a complete act in the eternal mind of God, without the being or consideration of faith, or any foresight of it. In the account of God, a man is as much justified before his faith as after it; and after he does believe, his justification depends not on his acts of faith, for though *we believe not, yet God abides faithful* to his covenant-engagements with his Son, by whose suretyship-righteousness the elect are justified; but by faith men have a comfortable sense, perception, and apprehension, of their justification, and enjoy that peace of soul which results from it. It is by that only, under the testimony of the Divine Spirit, that they know their interest in it, and can claim it, and so have the comfort of it."

† *Body of Divinity*, vol. i. book ii. § 5.
‡ Rom. i. 17.
‖ 1 Cor. vi. 11.

Though this language differs from that of the Westminster Confession, the author seems not to teach a different doctrine; for if faith be that grace by which a soul renounces its own righteousness, and lays hold of Christ's, which it puts on as a garment, it must be that very thing which the compilers of the Confession meant by their definition of faith receiving and resting on Christ and his righteousness, when they called it "the alone instrument of justification." Accordingly our author elsewhere * teaches, that "true faith in sensible sinners assents to Christ and embraces him, not merely as a Saviour of man in general, but as a special suitable Saviour for them in particular. It proceeds upon Christ's being revealed *in* them as well as *to* them, by the spirit of wisdom and revelation, in the knowledge of him as a Saviour that becomes them. It comes not merely through external teachings by the hearing of the word from men; for no man, faith our blessed Lord, can come to me except the Father draw him; but such souls as are thus drawn, having heard and learned of the Father, believe not only in the *doctrine* of Christ, but also in *himself*, trusting in him alone for everlasting life and salvation."

* *Body of Practical Divinity*, book i. chap. 6.

Theology more peculiarly Christian.

Were it not that this author, in every thing that he writes, has an eye to the doctrine of election and reprobation, which he carries to a greater height than almost any other divine with whose works we are acquainted, he would differ little in his notions of justification from the more moderate Arminians. "Justification (says Limborch) is the merciful and gracious act of God, whereby he fully absolves from all guilt the truly penitent and believing soul, through and for the sake of Christ apprehended by a true faith: or gratuitously remits sins upon the account of faith in Jesus Christ, and graciously imputes that faith for righteousness." Here indeed the imputation of Christ's righteousness is expressly denied; but Dr Waterland, who can hardly be considered as a Calvinist, seems to contend for the imputation of that righteousness to the sinner, as well as for faith being the instrument by which it is received.

204 And of the more moderate Arminians.

"It cannot be for nothing (says that able writer *) that St Paul so often and so emphatically speaks of man's being justified by faith, or through faith in Christ's blood; and that he particularly notes it of Abraham, that he *believed*, and that his faith was counted to him for justification, when he might as easily have said that Abraham, to whom the gospel was preached, was justified by gospel-faith and obedience, had he thought faith and obedience equally instruments of justification. Besides, it is on all hands allowed, that though St Paul did not directly oppose faith to *evangelical works*, yet he comprehended the works of the *moral law* under those which he excluded from the office of *justifying*, in his sense of the word justification. He even used such arguments as extended to all kinds of works; for Abraham's works were excluded, though they were undoubtedly evangelical. To prove that he interprets the apostle's doctrine fairly, our author quotes, from the genuine epistle of Clemens of Rome, a passage, in which it appears beyond a doubt that this fellow-labourer of St Paul so understood the doctrine of justifying faith as to oppose it even to evangelical works, however exalted. It is true (continues our author), Clemens elsewhere, and St Paul almost everywhere, insists upon true holiness of heart and obedience of life as indispensable conditions of salvation or justification; and of that, one would think, there could be no question among men of any judgment or probity. But the question about conditions is very distinct from the other question about instruments; and therefore both parts may be true, viz. that faith and obedience are equally conditions, and equally indispensable where opportunities permit; and yet faith over and above is emphatically the instrument both of receiving and holding justification, or a title to salvation.

* *Summary View of Justification.*

205 Faith the instrument of it.

"To explain this matter more distinctly, let it be remembered, that God may be considered either as a party contracting with man on very gracious terms, or as a Judge to pronounce sentence on him. Man can enter into the covenant, supposing him adult, only by assenting to it, and accepting it, to have and to hold it on such kind of tenure as God proposes: that is to say, upon a self-denying tenure, considering himself as a guilty man standing in need of pardon, and of borrowed merits, and at length resting upon mercy. So here, the previous question is, Whether a person shall consent to hold a privilege upon this submissive kind of tenure or not?

Theology more peculiarly Christian.

not? Such assent or consent, if he comes into it, is the very thing which St Paul and St Clemens call *faith*. And this previous and general question is the question which both of them determine against any proud claimants who would hold by a more self-admiring tenure.

"Or if we next consider God as sitting in judgement, and man before the tribunal going to plead his cause; here the question is, What kind of plea shall a man resolve to trust his salvation upon? Shall he stand upon his innocence, and rest upon strict law? or shall he plead guilty, and rest in an act of grace? If he chooses the former, he is proud, and sure to be cast: if he chooses the latter, he is safe so far in throwing himself upon an act of grace. Now this question also, which St Paul has decided, is previous to the question, What conditions even the act of grace itself finally insists upon? A question which St James in particular, and the general tenure of the whole Scripture, has abundantly satisfied; and which could never have been made a question by any considerate or impartial Christian. None of our works are good enough to stand by themselves before him who is of purer eyes than to behold iniquity. Christ only is pure enough for it at first hand, and they that are Christ's at second hand in and through him. Now because it is by faith that we thus interpose, as it were, Christ between God and us, in order to gain acceptance by him; therefore faith is emphatically the instrument whereby we receive the grant of justification. Obedience is equally a condition or qualification, but not an instrument, not being that act of the mind whereby we look up to God and Christ, and whereby we embrace the promises."

206 Faith and obedience its conditions.

But though our author contends that faith is the instrument of justification, he does not, like the Antinomians, teach that it will save men without works. "The covenant of grace (says he) has conditions annexed to it of great importance, for without them no instruments can avail. These are faith and obedience, as St James hath particularly maintained. St Paul had before determined the general and previous question respecting the plea by which we ought to abide; and when some libertines, as is probable, had perverted his doctrine of faith and grace, St James showed that the very faith which rests in a covenant of grace implies a cordial submission to the conditions of that covenant, otherwise it would be nothing but an empty ceremony. The perfect agreement between St Paul and St James in the article of *justification*, appears very clear and certain. St Paul declares, that in order to come at justification, it is necessary to stand upon grace, not upon merit; which St James does not deny, but rather confirms, in what he says of the perfect law of liberty (James i. 25. ii. 12). St Paul makes faith the instrument of receiving that grace; which St James does not dispute, but approves by what he says of Abraham (ii. 23.); only he maintains also, that, in the conditionate sense, justification depends equally upon faith and good works; which St Paul also teaches and inculcates in effect, or, in other words, through all his writings. If St Paul had had precisely the same question before him which St James happened to have, he would have decided just as St James did; and if St James had had precisely the same question before him which St Paul had, he would have determined just as St Paul did. Their principles were exactly the same, but the questions were diverse; and they had different adversaries to deal with, and opposite extremes to encounter, which is a common case.

"It may be noted, that that faith which is here called a *condition*, is of much wider compass than that particular kind of faith which is precisely the instrument of justification. For faith as a condition means the whole complex of Christian belief, as expressed in the creeds; while faith as an instrument means only the laying hold on grace, and resting in Christ's merits in opposition to our own deservings: though this also, if it is a vital and operative principle (and if it is not, it is nothing worth), must of course draw after it an hearty submission to, and observance of, all the necessary conditions of that covenant of grace wherein we repose our whole trust and confidence. So that St Paul might well say, "Do we then make void the law (the moral law) through faith? God forbid: Yea, we establish the law *." We exempt no man from religious duties; which are duties still, though they do not merit nor are practicable to such a degree as to be above the need of pardon: they are necessary conditions in their measure of justification, though not sufficient in themselves to justify, nor perfect enough to stand before God or to abide trial: therefore Christ's merits must be taken in to supply their defects: and so our resting in Christ's atonement by an humble self-denying faith is our last resort, our anchor of salvation both sure and stedfast, after we have otherwise done our utmost towards the fulfilling of God's sacred laws, towards the performing of all the conditions required.

* Rom. iii. 31.

"That good works, internal and external, are according as opportunities offer and circumstances permit, *conditions* properly so called, is clear from the whole tenor of Scripture, as hath been often and abundantly proved by our own divines (M), and is admitted by the most judicious among the foreign Reformed (N). Yet some have been very scrupulous as to this innocent name, even while they allow the absolute necessity of good works as indispensable qualifications for future blessedness. Why not conditions therefore as well as qualifications? Perhaps because that name might appear to strike at absolute predestination, or unconditional election; and there may lie the scruple: otherwise the difference appears to lie rather in words than in things.

"Some will have them called not conditions, but *fruits* or *consequents* of justification. If they mean by justification the same as the grace of the Holy Spirit, and the first grace of faith springing from it, they say true; and then there is nothing more in it than an improper use of the word *justification*, except that from abuse of words very frequently arises some corruption of doctrine. If they mean only, that outward acts of righteousness are fruits of inward habits or dispositions; that

(M) Bull. *Op. Latin.* p. 412, 414, 415, 430, 434, 514, 516, 544, 583, 645, 668. *Edit. ult.*—Stillingfleet's Works, vol. iii. p. 367, 380, 393, 398.—Tillotson's Posthumous Sermons, vol. ii. p. 484, 487.

(N) Vossius *de Bonis Operibus*, Thes. x. p. 370.—Op. tom. vi.—*Frid. Spanhem. fil.* Op. tom. iii. p. 141, 159.

Theology more peculiarly Christian.

that alſo is undoubtedly true: but that is no reaſon why internal acts, virtues, graces (good works of the mind), ſhould not be called conditions of juſtification; or why the outward acts ſhould not be juſtly thought conditions of preſerving it. But if they mean that juſtification is ordinarily given to adults, without any preparative or previous conditions of faith and repentance, that indeed is very new doctrine and dangerous, and opens a wide door to carnal ſecurity and to all ungodlineſs."

Such is the doctrine of Chriſtian juſtification as it has been taught by the followers of Calvin, and by ſome of the moſt eminent Arminians who flouriſhed in the end of the 17th and beginning of the 18th century. They appear not, from this view of their opinions, to differ ſo widely as ſome of them have wiſhed the world to believe. It is evident that Dr Waterland, though he rejects ſome of the diſtinguiſhing tenets of Calviniſm, lays greater ſtreſs upon faith in his ſcheme of juſtification than Dr Gill himſelf; and that they both conſider it as the *inſtrument* by which the adult Chriſtian muſt receive the imputed righteouſneſs of Chriſt. The greater part of modern Arminians, however, exclaim againſt the imputation of Chriſt's righteouſneſs, as a doctrine falſe in itſelf, and fraught with the moſt pernicious conſequences; and they would be ready to tell Dr Gill, in his own words, that of his ſcheme every article is wrong. It is not true (ſay they) that God exacts of man, or ever did exact of him, an obedience abſolutely perfect; for under every diſpenſation man was in a ſtate of diſcipline, and had habits of virtue and piety to acquire; and it is probable that his progreſs in piety, virtue, and wiſdom, will continue for ever, as none but God is perfect and ſtationary, and incapable of deviating from the line of rectitude. Moſt of them, after Biſhop Bull, diſlike the uſe of ſuch unſcriptural phraſes as *the inſtrument of juſtification*, applied either to faith or to works; and think, that by conſidering God as the ſole juſtifier of man, upon certain conditions, they can more preciſely aſcertain the diſtinct provinces of faith and obedience in the ſcheme of juſtification, than either their brethren of the old ſchool of Arminius, or their rivals of the ſchool of Calvin.

207 Objections of the more zealous Arminians to this ſtatement of the doctrine.

208 Their own ſtatement of it.

By the very conſtitution of man, piety and virtue are duties which, if he do not ſincerely perform, he muſt of courſe forfeit the favour of his Maker; but the moſt perfect performance of his natural duties would not entitle him to a ſupernatural and eternal reward. Eternal life is the *gift* of God through Jeſus Chriſt; and it is ſurely reaſonable that we ſhould acknowledge it to be ſo, and not claim it as a debt due to our merits. The pious and virtuous man has a natural claim to more happineſs than miſery during the period of his exiſtence, a claim founded on the attributes of that God who called him into being; but he has no natural claim to a future life, and ſtill leſs to a perpetuity of exiſtence. This is a truth not more clearly taught in the holy ſcripture than conſonant to the ſoundeſt philoſophy: and yet, by not attending to it, have St Paul and St James been ſet at variance, and the moſt oppoſite doctrines taught reſpecting the juſtification of Chriſtians.

Becauſe faith in Chriſt cannot entitle a wicked man to eternal *happineſs*, one claſs of divines ſeem to infer that ſuch faith is not neceſſary to Chriſtian *juſtification*, and that "his faith cannot be wrong whoſe life is in the right." They proceed upon the ſuppoſition that man is naturally immortal; that piety and virtue are entitled to reward; and that therefore the pious and virtuous man, whatever be his belief, muſt undoubtedly inherit an eternal reward. But this is very fallacious reaſoning. That piety and virtue are through the divine juſtice and benevolence entitled to reward, is indeed a truth incontrovertible; but that man who is of yeſterday is naturally immortal; that a being who began to exiſt by the mere good will of his Maker, has in himſelf a principle of perpetual exiſtence independent of that will—is a direct contradiction. Whatever began to be, can be continued in being only by the power, and according to the pleaſure, of the infinite Creator; but it pleaſed the Creator of his free grace at firſt to promiſe mankind eternal life, on the ſingle condition of their firſt father's obſerving one poſitive precept. That precept was violated, and the free gift loſt: but the covenant was renewed in Chriſt, who "by his death hath aboliſhed death, and by his reſurrection hath brought to light life and immortality." The condition annexed to the gift thus reſtored was faith; for "being juſtified by faith *, we have peace with God through our Lord Jeſus Chriſt; by whom alſo we have acceſs by faith into this grace wherein we ſtand, and rejoice in the hope of the GLORY OF GOD." Faith therefore in the Son of God and Saviour of the world, is not only a condition, but the *ſole* condition, of that juſtification which is peculiarly Chriſtian; for ſince Chriſt, without any co-operation of ours, hath purchaſed for us the free gift of eternal life, we ſhall be guilty of the groſſeſt ingratitude to our Divine Benefactor, and impiouſly claim an independence on God, if we look upon that gift either as a right inherent in our nature, or as a debt due to our meritorious deeds.

209 Faith the ſole condition of the juſtification peculiarly Chriſtian; * Rom. v. 1, 2.

210 but not of obtaining eternal happineſs.

But though faith be the condition of juſtification, as that implies the inheritance of *eternal life*, there are other conditions to be performed before a man can be put in poſſeſſion of *eternal felicity*. By a law long prior to the promulgation of the goſpel—a law interwoven with our very being—no man can enjoy the favour of his Maker, who does not make it his conſtant endeavour "to do juſtly, to love mercy, and to walk humbly with his God." This law was in force before man fell; it continues to be in force now that he is redeemed; and it will not be abrogated even at that period when faith ſhall give place to viſion, and hope to enjoyment. By the grace of the Chriſtian covenant, all mankind are rendered immortal in conſequence of the death and reſurrection of Chriſt, who is the Lamb ſlain, in the divine decree, from the foundation of the world; but to obtain immortal *happineſs*, they muſt obſerve the conditions both of natural and of revealed religion, which are repentance from dead works, and faith in Chriſt the Redeemer. The former is that condition upon which alone we can retain the Divine favour, and of courſe enjoy either preſent or future happineſs; the latter is a moſt equitable acknowledgement required of us, that perpetual conſcious exiſtence is neither a right inherent in our nature, nor a debt due to our virtuous obedience, but merely the gift of God through Jeſus Chriſt our Lord.

211 The different conditions of divine favour and of eternal life.

"To make the diſtinct provinces of faith and works in the buſineſs of juſtification clear, let us ſuppoſe (ſays Biſhop Warburton †), that, at the publication of the goſpel, all to whom the glad tidings of immortality were

† *Div. Leg.* book ix. chap. 3.

Theology more peculiarly Christian.

were offered on the condition of *faith in Jesus* had been moral or virtuous men, and on that account entitled (as natural religion teacheth) to the favour of God and an abundant reward; is it not self-evident, that FAITH ALONE, exclusive of the condition of good works, would, in that case, have been the very thing which *justified* or entitled them to life *everlasting?* But are *good works*, therefore, of no use in the Christian system? So far from it, that those only who serve God in sincerity and in truth are capable of the justification which faith alone embraces; for, to illustrate this matter by a familiar instance, suppose a British monarch to bestow, in *free gift*, a certain portion of his own *domains*, to which immortality may well be compared, upon such of his subjects as should perform a certain service to which they were not obliged by the laws of the kingdom; it is evident that the performance of this last service ONLY would be the thing which entitled them to the *free gift*. Yet it is obvious that obedience to the laws, which gave them a claim to protection as subjects, in the enjoyment OF THEIR OWN PROPERTY (to which the reward offered by natural religion may be compared), would be a previous and necessary qualification to their enjoyment of their new possession; since it is absurd to suppose that such a *gift* could be intended for rebels and traitors, or indeed for any but good and faithful servants of their king and country." Well therefore might the apostle reprove the ignorance or licentiousness of certain of his converts at Rome, in his question—"Do we then make void the LAW through FAITH? God forbid! yea, we ESTABLISH THE LAW;" obedience to it being the previous qualification of all who are entitled to the fruits of justifying faith—LIFE AND IMMORTALITY.

212 Illustrated by a familiar example.

Had proper attention been paid to this distinction, which St Paul everywhere makes between such duties as are common to all religions that are true, and those which are peculiar to the Christian revelation, many useless controversies might have been avoided respecting the instrument of justification and the conditions of the Christian covenant. By not attending to it, the divines of one school, who perceive that the mere belief of any truth whatever cannot entitle a man to eternal felicity, have almost dropt faith from their system of Christianity, and taught moral duties like Pagan philosophers; whilst another party, who err almost as far in their interpretations of scripture, finding eternal life represented as the *gift of God*, and faith in Christ as the instrument or means by which that gift must be accepted, have expunged from their system the necessity of good works, forgetting surely that wicked believers, like believing devils, may be doomed to an eternity of torments. But the sum of Christianity, as we are taught by the beloved disciple, is comprehended in this one commandment of God, "that we should believe on the name of his Son Jesus Christ, and love one another as he gave us commandment." In perfect harmony with him, the great apostle of the Gentiles assures us *, that "in Christ Jesus nothing can avail to our eternal happiness but faith which WORKETH BY LOVE;" and he informs Titus †, that it "is a true saying, and what he wills to be constantly affirmed, that they who have believed in God be careful to maintain good works."

213 Sum of Christianity.

* Gal. v. 6.

† Chap. iii. 8.

Indeed no man can have complete faith in Christ, who believes not the promises of the gospel; but all those promises, except the single one of a resurrection from the dead to perpetual conscious existence, are made to us upon the express condition that we obey the law of the gospel; "for God will render to every man according to his deeds: to them that are contentious and do not obey the truth, but obey unrighteousness, indignation and wrath; tribulation and anguish upon every soul of man that doth evil, of the Jew first and also of the Gentile; but glory, honour, and peace to every man that worketh good, to the Jew first and also to the Gentile *."

Theology more peculiarly Christian.

* Rom. ii. 8, 9.

Such are the notions of justification entertained by those who in the present age have been considered as the leaders † of the sect of Arminians. How far they are just, the reader must decide for himself; but under every view of this doctrine which we have taken, the Christian covenant appears much more gracious than that into which Adam was admitted in paradise: since it affords room for repentance, even to that man, who may be so unhappy as to be drawn for a time into apostacy from the terms of the covenant. Whether the death of Christ therefore was a *direct* atonement for the actual sins of men, or only operated as such *indirectly* by procuring for them repeated opportunities of repentance, it is an undoubted truth, that "if through the offence of one many be dead, much more the grace of God, and the gift by grace, which is by one man, Jesus Christ, hath abounded unto many. And not as it was by one that sinned, so is the gift: for the judgement was of one offence to *condemnation*, but the free gift is of many offence to *justification* ‡."

† *Warburton* and *Law*, &c.

214 The Christian covenant more gracious than the paradisaical

Thus graciously has the divine goodness displayed itself in the restoration of our lost inheritance. But it stopt not here. The same bountiful Lord of life, for its further security, imparts to every true believer the strength and light of his holy spirit to support faith in working out our own salvation. Our blessed Saviour promised, before he left this world, to send to his followers the Holy Ghost or Comforter to abide with them for ever, to guide them into all truth, to bring all things to their remembrance whatsoever he had said unto them, and, as we learn from other passages of scripture, to "work in them both to will and to do of his good pleasure." How amply this promise was fulfilled to the apostles, we have already seen; but we are not to suppose that it was restricted to them. As man is designed for a supernatural state in heaven, he stands in need of supernatural direction to guide him to that state. "No man (says our Saviour) can come to me except the Father draw him; for as no man knoweth the things of a man save the spirit of a man which is in him, even so none knoweth the things of God but the Spirit of God." This omniscient Spirit indeed "searcheth all things, yea even the deep things of God," and revealeth them to the sons of men, to enlighten their understandings and purify their hearts. The grace which he sheds abroad is either external and general, or internal and particular. The former has been extended to the whole church of God under the patriarchal, Mosaic, and Christian dispensations, in such a revelation of the divine will as was sufficient to instruct men unto eternal life, whether they had a clear view or not of that stupendous plan of redemption, by which the kingdom of heaven was opened to them after the forfeiture of the terrestrial paradise; for there have been "holy prophets ever since the world began;

‡ Rom. v. 16, 17.

215 Christians sanctified by the Holy Ghost, who

Theology more peculiarly Christian.

began; and prophecy came not at any time by the will of man, but holy men of God spake as they were moved by the Holy Ghost *." Hence it is that all scripture was given by inspiration of God to teach us every thing which it is necessary for us to know and believe; and the scripture is that work of the spirit which is extended to the universal church.

* Luke i. 70. and 2 Peter i. 21.

But the same spirit which thus generally reveals the object of faith to the church, does likewise particularly illuminate the minds of individual believers, working in them an assent to that which is taught them from the written word. It was thus that "the Lord opened the heart of Lydia †; that she attended to the things which were spoken by Paul;" it is thus that "the word preached doth not profit if it be not mixed with faith in them who hear it ‡;" and it is thus that "God deals to every man the measure of faith ||;" for "by grace are we saved through faith, which is not of ourselves; it is the gift of God §." This illumination of the Spirit was conveyed to the apostles "in a sound from heaven as of a rushing mighty wind," because it was meant to testify to the world that they were chosen ministers of the gospel; but the ordinary Christian receives it "in the still small voice," because it is conveyed to him only to "open his understanding that he may understand the scriptures."

† Acts xvi. 14.

‡ Heb. iv. 2.
|| Rom. xii. 3.
§ Eph. ii. 8.

216 regenerates them,

Another operation of the Spirit on the minds of believers is that which in scripture is called REGENERATION; for "according to his mercy God saveth us by the washing of regeneration and renewing of the Holy Ghost *, which he sheds on us abundantly through Jesus Christ our Lord." To those who believe that we derive from Adam a corrupted nature, this particular grace must appear so absolutely necessary, that without it we could have no relish for heaven or heavenly things." "The natural man (we are told) receiveth not the things of the spirit of God; for they are foolishness to him; neither can he know them, because they are spiritually discerned." Indeed whatever be the powers of our moral faculties, when compared with those of our first father, it is so long before they be completely developed, that we should infallibly be lost, if we were not blessed by a supernatural guide, when reason is incapable of directing our conduct. Our passions and appetites are in their full strength before experience has furnished the mind with materials, by means of which motives may be weighed; and therefore it would be impossible, during the giddy period of youth, to keep them in due subjection, or to prevent vicious habits from being formed, were we not influenced by divine grace. So true is it, that "except a man be born again of water and of the Holy Ghost, he cannot enter into the kingdom of God." This change in our dispositions, from an immoderate attachment to earth to a relish for the things of heaven, is in scripture called "a renewing of our minds, a new creation, a new man;" in opposition to our natural disposition, which is called "the old man, corrupted according to the deceitful lusts." The ancient fathers of the church, as well as some very eminent modern divines †, generally speak of baptism as the instrument in God's hand of man's regeneration; and for the truth of their opinion they appeal to John iii. 3, 5. Ephes. v. 25, 26. and 1 Cor. vi. 11. in which great stress is certainly laid on the washing of water, as well as on sanctification by the word.

* Titus i. 5, 6.

† *Clarke* and *Waterland.*

A third office of the Holy Spirit is to lead, direct, and govern us through all the periods of our lives. Without such a leader and guide, the temptations with which we are surrounded would certainly overcome us, and we should faint long before we arrive at the end of our journey. By the very constitution of our nature we are subjected in some degree to the influence of sense, of which the objects are present, whilst the enjoyments of heaven are future, and seen, as at a distance, only by the eye of faith; but "the law of the Spirit of life, in Christ Jesus, hath made us free from the law of sin and death;" for God worketh in us both to will and to do of his good pleasure; and as many as are thus led by the spirit of God, they are the sons of God; and while they walk in the Spirit, they do not fulfil the lusts of the flesh." Without the aid of the same Spirit, we could not even make our prayers acceptable; for since "our confidence in God is, that he heareth us only when we ask any thing according to his will; and since we know not what we should pray for as we ought, the Spirit itself maketh intercession for us with groanings which cannot be uttered *.

Theology more peculiarly Christian.

217 guides them through life,

* Rom. viii. 26.

A fourth operation of the Holy Ghost, as he is the sanctifier of Christians, is to join them to Christ, and make them members of that one body of which he is the head. "For by one Spirit are we all baptized into one body †; and as the body is one and hath many members, and all the members of that one body being many are one body, so also is Christ." "Hereby we know that God abideth in us, by the Spirit which he hath given us;" and as, in the ordinary course of his dealings with Christians, this Spirit is first given in baptism, so is it continued to the faithful by the instrumentality of the Lord's supper. That ordinance we have elsewhere (see *SUPPER of the Lord*) proved to be a federal rite; and surely no time can be supposed so highly sanctified for the reception of the graces of the Holy Spirit, as that in which we renew our federal union with our Lord and Master in the communion of his body and blood.

† 1 Cor. xii. 12, 13.

218 unites them to Christ,

It is likewise the office of the Holy Ghost to give us an earnest of our everlasting inheritance, to create in us a sense of the paternal love of God, and thereby to assure us of the adoption of sons. "As many as are led by the Spirit of God, they are the SONS of God; and because we are sons, God hath sent forth the spirit of his Son into our hearts. For we have not received the spirit of bondage again to fear; but we have received the Spirit of adoption, whereby we cry Abba Father; the Spirit itself bearing witness with our spirit, that we are the children of God ‡".

‡ Gal. iv. 6. Rom. viii. 15, 16.

As the gifts of grace are generally annexed to means, to the proper use of the word and sacraments, it is a sixth office of the same Spirit to sanctify such persons as are regularly set apart for the work of the ministry, and ordained to offer up the public prayers of the people; to bless them in the name of God; to teach the doctrines of the gospel; to administer the sacraments instituted by Christ; and to perform all things necessary "for the perfecting of the saints, for the work of the ministry, for the edifying of the body of Christ ||." The same Spirit which illuminated the apostles, and endowed them with power from above to perform personally their apostolic functions, fitted them also for sending others, as they were sent by their Divine Master; and for establishing

219 and sanctifies the administrations of the ministers of the gospel.

|| Eph. iv. 12.

Theology more peculiarly Christian.

bliſhing ſuch a conſtitution of the church as was beſt adapted for preſerving Chriſtians in the unity of the Spirit and bond of peace. They committed a ſtanding power to a ſucceſſive miniſtry to be conveyed down to the end of the world; and thoſe who are veſted with that power are obliged to "take heed unto themſelves, and to all the flock over which the HOLY GHOST hath made them overſeers, to feed the church of God, and to contend earneſtly for the faith which was once delivered unto the ſaints *." See EPISCOPACY, INDEPENDENTS, PRESBYTERIANS, POPE, and QUAKERS.

* Acts xx. 28. and Jude ver. 3.

By theſe, and the like means, doth the Spirit of God ſanctify the ſons of men; and in conſequence of this ſanctification proceeding immediately from his office, he is called the HOLY Spirit and the COMFORTER. This is ſuch a proviſion "for renewing us in the ſpirit of our minds, and enabling us to put on the new man, which, after God, is created in righteouſneſs and true holineſs," as, when made known by revelation appears to have been expedient, may be conceived to have been even neceſſary, and, though reaſon could hardly have hoped for it, is contradicted by none of our natural notions either of God or of man. Many, however, are the controverſies to which it has given riſe in the church of God; ſome contending that it is given only unto the elect, upon whom it operates with reſiſtleſs efficacy; others affirming that it is offered to all, but in ſuch a manner as that, by the abuſe of their free will, it may be "reſiſted, grieved, and quenched;" and ſome few, ſtill intoxicated with the pride of PELAGIUS, think it is not neceſſary, and of courſe is not beſtowed.

220 Controverſies occaſioned by this doctrine

The queſtions concerning *election*, the *efficacy of grace*, and the final *perſeverance of the ſaints*, we have ſtated elſewhere, and given a ſummary view of the arguments by which the contending parties maintain their reſpective opinions (ſee PREDESTINATION); and the texts of Scripture which we have juſt quoted, under the different heads of ſanctification, ſhow ſufficiently that the opinion of Pelagius is directly contrary to the doctrine of the apoſtles. It may not be improper to enquire whether it be as agreeable to reaſon and experience as its patrons ſeem to imagine.

221 diſcuſſed elſewhere.

If it be unreaſonable to expect any aſſiſtance from the Spirit of God in carrying on the work of our own ſalvation, how came ſo many of the wiſeſt and beſt of men in all ages to believe, that he who ſincerely endeavours to diſcharge his duty is ſupported in that endeavour by aſſiſtance from heaven? That ſuch was the popular belief of the early Greeks, is evident from the poems of Homer; in which we everywhere find ſome god calming the paſſions of the heroes, altering their determinations when improper, and inſpiring them with wiſdom. Nor was this the ſentiment of the poets only. Socrates, it is well known, profeſſed to believe that his own conduct was under the direction of a ſuperior ſpirit, which he called a *dæmon*; and Plutarch, as we find him quoted by Wollaſton, ſpeaks of the gods aſſiſting men, by "exciting the powers or faculties of the ſoul; by ſuggeſting ſecret principles, imaginations, or thoughts; or, on the contrary, by diverting or ſtopping them." Of the ſame opinion muſt Cicero have been, when he ſaid, "ſtabit illud quod dicam, quod locum hunc continet, de quo agimus, eſſe Deos, et eorum providentia mundum adminiſtrari, eoſdemque conſulere rebus humanis, nec ſolum *univerſis*, verum etiam SINGULIS *;" for it is not conceivable that a particular providence can be adminiſtered without the influence of the Deity on the minds of men. That the poets and philoſophers of the heathen world derived theſe notions from primeval tradition, cannot, we think, be queſtioned; but if they were abſurd in themſelves, or apparently contradictory to the laws of nature, they would not ſurely have been ſo univerſally embraced; for it will ſcarcely be denied, that Socrates and Cicero were men of as great natural ſagacity as Pelagius or any of his followers. It is indeed ſo far from being incredible that the Father of ſpirits occaſionally directs the thoughts and actions of men, that we believe there are very few who have made obſervations on themſelves and their own affairs, who have not found, on reflection, many inſtances in which their uſual judgement and ſenſe of things were *overruled*, they know not *how* or *why*; and that the actions which they performed in thoſe circumſtances have had conſequences very remarkable in their general hiſtory. See PROVIDENCE, N° 18, 19.

222 Opinions of the heathens concerning it.

* De Div. lib. i. ſect. 51.

Theology more peculiarly Chriſtian.

This being the caſe, why ſhould the pride of Chriſtians make them heſitate to admit, on the authority of divine revelation, what Socrates, and Plutarch, and Cicero, and all the virtuous and wiſe men of antiquity, admitted in effect, on no better evidence than that of oral tradition, ſupported by their own meditations on their own thoughts, and the principles of their own conduct? Is it that they ſee not ſuch beneficial effects of Chriſtianity as to induce them to believe the profeſſors of that religion to be indeed "choſen to ſalvation through the ſanctification of the Spirit †?" Let them ſtudy the practical precepts of the goſpel, conſider the conſequences which they have had on the peace and happineſs of ſociety, and compare the general conduct of Chriſtians with that of the Jews, Pagans, and Mahometans (ſee RELIGION), and they will doubtleſs find reaſon to alter their opinion; and let thoſe who embrace the truth, remember, that as they are the temple of God, if the Spirit of God dwell in them, "it is their indiſpenſable duty to cleanſe themſelves from all filthineſs of the fleſh and ſpirit; to follow peace with all men, and holineſs, without which no man ſhall ſee the Lord; and to work out their own ſalvation with fear and trembling, ſince it is God who worketh in them both to will and to do of his good pleaſure."

† Theſſ. iii. 3.

223 The goſpel the laſt revelation.

From this ſhort view of the ſeveral diſpenſations of revealed religion, it is evident that the goſpel is not only the beſt but the laſt gift of the kind which man has to expect from his Maker; that the ſcheme of revelation is completed; and that the pretences of Mahomet and of more modern enthuſiaſts to divine inſpiration are not only falſe, but fraught with contradictions. All theſe men admit the divine origin of the Moſaic and Chriſtian religions; but it appears from the ſcriptures, in which thoſe religions are taught, that the ſyſtem of revealed truths which conſtitute the Patriarchal, Moſaic, and Chriſtian revelations, commenced with the fall of man, and that it muſt therefore neceſſarily end with his reſtoration to life and immortality by the ſacrifice of Chriſt upon the croſs. A new revelation therefore like that of Mahomet cannot be admitted without rejecting the whole Bible, though the impoſtor himſelf everywhere acknowledges the inſpiration of Abraham, of Moſes, and of Chriſt. Nor is greater regard due to the claims of Chriſtian enthuſiaſts. Such as pretend to have

Theology more peculiarly Christian.

have been in heaven *, and thence to have brought spiritual discoveries to the earth, have either forgotten or never understood, that in the scriptures of the Old and New Testaments the great scene of Providence appears to be closed in the full completion of its one regular, entire, and eternal purpose; that St Paul has pronounced † a curse on any man or angel from heaven who shall preach another gospel than what has been already preached by the apostles and evangelists; that in their writings we are taught every thing which it is our duty to believe or to practise in order to our own salvation; and that we have the promise of our blessed Lord himself, that the Spirit of truth shall remain with us to guide us into all necessary truth, till that great day when he shall come again to judge the world in righteousness, and render to every man according to his works.

* *Bœhmen, Swedenbourg*, and others.

† Gal. i. 8.

Theology more peculiarly Christian.

THE

Theophrasta || Theorem.

THEOPHRASTA, a genus of plants belonging to the class pentandria. See BOTANY *Index*.

THEOPHRASTUS, the philosopher, was born about 371 years before Christ, and was successively the disciple of Plato and of Aristotle. He succeeded Aristotle in the Peripatetic school, and conducted the charge with such high reputation that he had about 2000 scholars. He is highly celebrated for his industry, learning, and eloquence; and for his generosity and public spirit. He is said to have twice freed his country from the oppression of tyrants. He contributed liberally towards defraying the expence attending the public meetings of philosophers; which were held, not for the sake of show, but for learned and ingenious conversation. In the public schools he commonly appeared, as Aristotle had done, in an elegant dress, and was very attentive to the graces of elocution. He lived to the advanced age of 85: some say of 107. Towards the close of his life, he grew exceedingly infirm, and was carried to the school on a couch. He expressed great regret on account of the shortness of life; and complained that nature had given long life to stags and crows, to whom it is of so little value, and had denied it to man, who, in a longer duration, might have been able to attain the summit of science; but now, as soon as he arrives within sight of it, is taken away. His last advice to his disciples was, that, since it is the lot of man to die as soon as he begins to live, they would take more pains to enjoy life as it passes, than to acquire posthumous fame. His funeral was attended by a large body of Athenians. He wrote many valuable works, of which all that remain are, several treatises on the Natural History of Plants and Fossils; Of Winds, Of Fire, &c. a rhetorical work entitled "Characters," and a few Metaphysical Fragments.

Enfield's History of Philosophy.

To Theophrastus we are indebted for preserving the works of Aristotle. See ARISTOTLE.

THEOPOMPUS, a celebrated Greek orator and historian, was born in the island Chios, and flourished in the reign of Alexander the Great. He was one of the most famous of all the disciples of Isocrates, and won the prize from all the panegyrists whom Artemisia invited to praise Mausolus. He wrote several works, which are lost.

THEOREM, a proposition which terminates in theory, and which considers the properties of things already made or done; or it is a speculative proposition deduced from comparing together several definitions. A theorem is something to be proved, and a problem something to be done.

THE

Theoretic || Thermæ.

THEORETIC, something relating to theory, or that terminates in speculation.

THEORY, in general, denotes any doctrine which terminates in speculation, without considering the practical uses or application thereof.

THEOSOPHISTS, a sect of men who pretend to derive all their knowledge from divine illumination. They boast that, by means of this celestial light, they are not only admitted to the intimate knowledge of God, and of all divine truth, but have access to the most sublime secrets of nature. They ascribe it to the singular manifestation of divine benevolence, that they are able to make such a use of the element of fire, in the chemical art, as enables them to discover the essential principles of bodies, and to disclose stupendous mysteries in the physical world. They even pretend to an acquaintance with those celestial beings which form the medium of intercourse between God and man, and to a power of obtaining from them, by the aid of magic, astrology, and other similar arts, various kinds of information and assistance.

Ibid.

To this class belonged Paracelsus, Robert Fludd, Jacob Bœhmen, Van Helmont, Peter Poiret, and the Rosicrucians. They are also called *FIRE-Philosophers*.

THERAPEUTÆ, a term applied to those that are wholly in the service of religion. This general term has been applied to particular sects of men, concerning whom there have been great disputes among the learned.

THERAPEUTICS, that part of medicine which acquaints us with the rules that are to be observed, and the medicines to be employed, in the cure of diseases.

THERMÆ, hot baths or bagnios. Luxury and extravagance were in nothing carried to such heights as in the thermæ of the Roman emperors. Ammian complains, that they were built to such an extent as to equal whole provinces; from which Valesius would abate, by reading *piscinæ* instead of *provinciæ*. And yet after all, the remains of some still standing are sufficient testimonies for Ammian's censure; and the accounts transmitted of their ornaments and furniture, such as being laid with precious stones (Seneca), set round with seats of solid silver (Pliny), with pipes and cisterns of the same metal (Statius), add to, rather than take from, the censure. The most remarkable bagnios were those of Diocleſian and Caracalla at Rome, great part of which remains at this day; the lofty arches, stately pillars, variety of foreign marble, curious vaulting of the roofs, great number of spacious apartments, all attract the curiosity of

Thermometer.

of the traveller. They had alſo their ſummer and winter baths.

THERMOMETER, an inſtrument for meaſuring the degree of heat or cold in any body.

1 Invention of the thermometer. *Martine's Eſſays.*

The thermometer was invented about the beginning of the 17th century; but, like many other uſeful inventions, it has been found impoſſible to aſcertain to whom the honour of it belongs. Boerhaave* aſcribes it to Cornelius Drebbel of Alcmar, his own countryman. Fulgenzio† attributes it to his maſter Paul Sarpi, the great oracle of the Venetian republic; and Viviani gives the honour of it to Galileo ‡. But all theſe are poſthumous claims. Sanctorio|| claims this honour to himſelf; and his aſſertion is corroborated by Borelli § and Malpighi † of the Florentine academy, whoſe partiality is not to be ſuſpected in favour of a member of the Patavinian ſchool.

* *Chem.* I. p. 152, 156.
† *Life F. Paul*, p. 158.
‡ *Vit. Galil.* p. 67.
|| *Corn. in Galen.* p. 736—342.
§ *De Mot. Animal.* II. prop. 175.
† *Opera Poſth.* p. 30.

Perhaps the beſt way to reconcile theſe different claims would be, to ſuppoſe that the thermometer was really invented by different perſons about the ſame time. We know that there are certain periods in the progreſs of the arts when the ſtream of human genius runs in the ſame direction, and moves towards the ſame object. That part of the current which reaches the object firſt may poſſeſs the title; but the other parts follow ſo rapidly and arrive ſo ſoon after, that it is impoſſible for a ſpectator to decide which is firſt in point of time.

2 The air-thermometer deſcribed.

The firſt form of this inſtrument for meaſuring the degrees of heat and cold, was the air-thermometer. It is a well known fact that air expands with heat ſo as to occupy more ſpace than it does when cold, and that it is condenſed by cold ſo as to occupy leſs ſpace than when warmed, and that this expanſion and condenſation is greater or leſs according to the degree of heat or cold applied. The principle then on which the air-thermometer was conſtructed is very ſimple. The air was confined in a tube by means of ſome coloured liquor; the liquor roſe or fell according as the air became expanded or condenſed. What the firſt form of the tube was, cannot now perhaps be well known; but the following deſcription of the air-thermometer will fully explain its nature.

Plate DXXXIII. Fig. 1.

The air-thermometer conſiſts of a glaſs tube BE, connected at one end with a large glaſs ball A, and at the other end immerſed in an open veſſel, or terminating in a ball DE, with a narrow orifice at D; which veſſel, or ball, contains any coloured liquor that will not eaſily freeze. Aquafortis tinged of a fine blue colour with a ſolution of vitriol or copper, or ſpirit of wine tinged with cochineal, will anſwer this purpoſe. But the ball A muſt be firſt moderately warmed ſo that a part of the air contained in it may be expelled through the orifice D; and then the liquor preſſed by the weight of the atmoſphere will enter the ball DE, and riſe, for example, to the middle of the tube at C, at a mean temperature of the weather; and in this ſtate the liquor by its weight, and the air included in the ball A, &c. by its elaſticity, will counterbalance the weight of the atmoſphere. As the ſurrounding air becomes warmer, the air in the ball and upper part of the tube, expanding by heat, will drive the liquor into the lower ball, and conſequently its ſurface will deſcend; on the contrary, as the ambient air becomes colder, that in the ball is condenſed, and the liquor preſſed by the weight of the atmoſphere will aſcend: ſo that the liquor in the tube will aſcend or deſcend more or leſs according to the ſtate of the air contiguous to the inſtrument. To the tube is affixed a ſcale of the ſame length, divided upwards and downwards from the middle C into 100 equal parts, by means of which the aſcent and deſcent of the liquor in the tube, and conſequently the variations in the cold or heat of the atmoſphere, may be obſerved.

3 Its defects.

This inſtrument was extremely defective; for the air in the tube was not only affected by the heat and cold of the atmoſphere, but alſo by its weight.

4 The ſpirit of wine thermometer.

The air being found improper for meaſuring with accuracy the variations of heat and cold according to the form of the thermometer which was firſt adopted, another fluid was propoſed about the middle of the 17th century by the Florentine academy. This fluid was ſpirit of wine, or alcohol, as it is now generally named. The alcohol being coloured, was incloſed in a very fine cylindrical glaſs tube previouſly exhauſted of its air, having a hollow ball at one end A, and hermetically ſealed at the other end D. The ball and tube are filled with rectified ſpirit of wine to a convenient height, as to C, when the weather is of a mean temperature, which may be done by inverting the tube into a veſſel of ſtagnant coloured ſpirit, under a receiver of the air-pump, or in any other way. When the thermometer is properly filled, the end D is heated red hot by a lamp, and then hermetically ſealed, leaving the included air of about one-third of its natural denſity, to prevent the air which is in the ſpirit from dividing it in its expanſion. To the tube is applied a ſcale, divided from the middle, into 100 equal parts, upwards and downwards.

As ſpirit of wine is capable of a very conſiderable degree of rarefaction and conſenſation by heat and cold, when the heat of the atmoſphere increaſes the ſpirit dilates, and conſequently riſes in the tube; and when the heat decreaſes, the ſpirit deſcends, and the degree or quantity of the motion is ſhown by a ſcale.

5 Its defects.

The ſpirit of wine thermometer was not ſubject to ſome of the inconveniences which attended the air thermometer. In particular, it was not affected by variations in the weight of the atmoſphere: accordingly it ſoon came into general uſe among philoſophers. It was, at an early period, introduced into Britain by Mr Boyle. *Martine's Eſſays.* To this inſtrument, as then uſed, there are, however, many objections. The liquor was of different degrees of ſtrength, and therefore different tubes filled with it, when expoſed to the ſame degree of heat, would not correſpond. There was alſo another defect: The ſcale which was adjuſted to the thermometer did not commence at any fixed point. The higheſt term was adjuſted to the great ſunſhine heats of Florence, which are too variable and undetermined; and frequently the workman formed the ſcale according to his own fancy. While the thermometer laboured under ſuch diſadvantages it could not be of general uſe.

6 Different fixed points propoſed by philoſophers.

To obtain ſome fixed unalterable point by which a determined ſcale might be diſcovered, to which all thermometers might be accurately adjuſted, was the ſubject which next drew the attention of philoſophers. Mr Boyle, who ſeems at an early period to have ſtudied this ſubject with much anxiety, propoſed the freezing of the eſſential oil of anniſeeds as a convenient point for graduating thermometers; but this opinion he ſoon laid aſide. Dr Halley next propoſed that thermometers

ſhould

Thermometer.

ſhould be graduated in a deep pit under ground, where the temperature both in winter and ſummer is pretty uniform; and that the point to which the ſpirit of wine ſhould riſe in ſuch a ſubterraneous place ſhould be the point from which the ſcale ſhould commence. But this propoſal was evidently attended with ſuch inconveniences that it was ſoon abandoned. He made experiments on the boiling point of water, of mercury, and of ſpirit of wine; and he ſeems rather to give a preference to the ſpirit of wine *. He objected to the freezing of water as a fixed point, becauſe he thought that it admitted conſiderable latitude.

* *Phil. Tranſ. Abr.* II. 34.

7 Sir Iſaac Newton's oil thermometer.

It ſeems to have been reſerved to the all-conquering genius of Sir Iſaac Newton to determine this important point, on which the accuracy and value of the thermometer depends. He choſe, as fixed, thoſe points at which water freezes and boils; the very points which the experiments of ſucceeding philoſophers have determined to be the moſt fixed and convenient. Senſible of the diſadvantages of ſpirit of wine, he tried another liquor which was homogeneous enough, capable of a conſiderable rarefaction, about 15 times greater than ſpirit of wine. This was linſeed oil. It has not been obſerved to freeze even in very great colds, and it bears a heat about four times that of water before it boils. With theſe advantages it was made uſe of by Sir Iſaac Newton, who diſcovered by it the comparative degree of heat for boiling water, melting wax, boiling ſpirit of wine, and melting tin; beyond which it does not appear that this thermometer was applied. The method he uſed for adjuſting the ſcale of this oil thermometer was as follows: Suppoſing the bulb, when immerged in thawing ſnow, to contain 10,000 parts, he found the oil expand by the heat of the human body ſo as to take up $\frac{1}{39}$th more ſpace, or 10,256 ſuch parts; and by the heat of water boiling ſtrongly 10,725; and by the heat of melting tin 11,516. So that reckoning the freezing point as a common limit between heat and cold, he began his ſcale there, marking it 0, and the heat of the human body he made 12°; and conſequently, the degrees of heat being proportional to the degrees of rarefaction, or 256 : 725 :: 12 : 34, this number 34 will expreſs the heat of boiling water; and by the ſame rule, 72 that of melting tin †. This thermometer was conſtructed in 1701.

† *Phil. Tranſ* N° 270. or *Abr.* vol iv. part 2.

8 Its imperfections.

To the application of oil as a meaſure of heat and cold, there are inſuperable objections. It is ſo viſcid, that it adheres too ſtrongly to the ſides of the tube. On this account it aſcends and deſcends too ſlowly in caſe of a ſudden heat or cold. In a ſudden cold, ſo great a portion remains adhering to the ſides of the tube after the reſt has ſubſided, that the ſurface appears lower than the correſponding temperature of the air requires. An oil thermometer is therefore not a proper meaſure of heat and cold.

9 Reaumur's ſpirit of wine thermometer.

All the thermometers hitherto propoſed were liable to many inconveniences, and could not be conſidered as exact ſtandards for pointing out the various degrees of temperature. This led Reaumur to attempt a new one, an account of which was publiſhed in the year 1730 in the Memoirs of the Academy of Sciences. This thermometer was made with ſpirit of wine. He took a large ball and tube, the dimenſions and capacities of which were known; he then graduated the tube, ſo that the ſpace from one diviſion to another might contain 1000th part of the liquor; the liquor containing 1000 parts when it ſtood at the freezing point. He adjuſted the thermometer to the freezing point by an artificial congelation of water: then putting the ball of his thermometer and part of the tube into boiling water, he obſerved whether it roſe 80 diviſions: if it exceeded theſe, he changed his liquor, and by adding water lowered it, till upon trial it ſhould juſt riſe 80 diviſions; or if the liquor, being too low, fell ſhort of 80 diviſions, he raiſed it by adding rectified ſpirit to it. The liquor thus prepared ſuited his purpoſe, and ſerved for making a thermometer of any ſize, whoſe ſcale would agree with his ſtandard.

Thermometer.

Martine's Eſſays on the Conſtruction of Thermometers.

10 Its defects.

This thermometer was far from being perfect. As the bulbs were three or four inches in diameter, the ſurrounding ice would be melted before its temperature could be propagated to the whole ſpirits in the bulb, and conſequently the freezing point would be marked higher than it ſhould be. Dr Martine accordingly found, that inſtead of coinciding with the 32d degree of Fahrenheit, it correſponded with the 34th, or a point a little above it. Reaumur committed a miſtake alſo reſpecting the boiling point; for he thought that the ſpirit of wine, whether weak or ſtrong, when immerged in boiling water, received the ſame degree of heat with the boiling water. But it is well known that highly rectified ſpirit of wine cannot be heated much beyond the 175th degree of Fahrenheit, while boiling water raiſes the quickſilver 37 degrees higher. There is another thermometer that goes by the name of *Reaumur's*, which ſhall be afterwards deſcribed.

11 Mercurial thermometers.

At length a different fluid was propoſed, by which thermometers could be made free from moſt of the defects hitherto mentioned. This fluid was mercury, and ſeems firſt to have occurred to Dr Halley in the laſt century; but was not adopted by him on account of its having a ſmaller degree of expanſibility than the other fluids uſed at that time *. Boerhaave ſays that the mercurial thermometer was firſt conſtructed by Olaus Roemer; but the honour of this invention is generally given to Fahrenheit of Amſterdam, who preſented an account of it to the Royal Society of London in 1724.

* *Phil. Tranſ.* vol. xvii. or *Abr.* vol. ii.

That we may judge the more accurately of the propriety of employing mercury, we will compare its qualities with thoſe of the fluids already mentioned, air, alcohol, and oil.

12 Properties of air, alcohol, and oil.

Air is the moſt expanſible fluid, but it does not receive nor part with its heat ſo quickly as mercury. Alcohol does not expand much by heat. In its ordinary ſtate it does not bear a much greater heat than 175° of Fahrenheit; but when highly rectified it can bear a greater degree of cold than any other liquor hitherto employed as a meaſure of temperature. At Hudſon's Bay, Mr Macnab, by a mixture of vitriolic acid and ſnow, made it to deſcend to 69 below 0 of Fahrenheit. This is an inconvenience, however, attending the uſe of this liquor; it is not poſſible to get it always of the ſame degree of ſtrength. As to oil, its expanſion is about 15 times greater than that of alcohol; it ſuſtains a heat of 600°, and its freezing point is ſo low that it has not been determined; but its viſcoſity renders it uſeleſs.

13 Thermometrical properties of mercury.

Mercury is ſuperior to alcohol and oil, and is much more manageable than air. 1. As far as the experiments

Thermometer.

Recherches sur les Mod. de l'Atmosphere.

ments already made can determine, it is of all the fluids hitherto employed in the conſtruction of thermometers, that which meaſures moſt exactly equal differences of heat by equal differences of its bulk: its dilatations are in fact very nearly proportional to the augmentations of heat applied to it (A). 2. Of all liquids it is the moſt eaſily freed from air. 3. It is fitted to meaſure high degrees of heat and cold. It ſuſtains a heat of 600° of Fahrenheit's ſcale, and does not congeal till it fall 39 or 40 degrees below 0. 4. It is the moſt ſenſible of any fluid to heat and cold, even air not excepted. Count Rumford found that mercury was heated from the freezing to the boiling point in 58 ſeconds, while water took two minutes 13 ſeconds, and common air 10 minutes and 17 ſeconds. 5. Mercury is a homogeneous fluid, and every portion of it is equally dilated or contracted by equal variations of heat. Any one thermometer made of pure mercury is, *cæteris paribus*, poſſeſſed of the ſame properties with every other thermometer made of pure mercury. Its power of expanſion is indeed about ſix times leſs than that of ſpirit of wine, but it is great enough to anſwer moſt of the purpoſes for which a thermometer is wanted.

* *Phil. Tranſ.* for 1786.

14 Fixed points.

The fixed points which are now univerſally choſen for adjuſting thermometers to a ſcale, and to one another, are the boiling and freezing water points. The boiling water point, it is well known, is not an invariable point, but varies ſome degrees according to the weight and temperature of the atmoſphere. In an exhauſted receiver, water will boil with a heat of 98° or 100°; whereas in Papin's digeſter it will require a heat of 412. Hence it appears that water will boil at a lower point, according to its height in the atmoſphere, or to the weight of the column of air which preſſes upon it. In order to enſure uniformity therefore in the conſtruction of thermometers, it is now agreed that the bulb of the tube be plunged in the water when it boils violently, the barometer ſtanding at 30 Engliſh inches (which is its mean height round London), and the temperature of the atmoſphere 55°. A thermometer made in this way, with its boiling point at 212°, is called by Dr Horſley *Bird's Fahrenheit*, becauſe Mr Bird was the firſt perſon who attended to the ſtate of the barometer in conſtructing thermometers.

Thermometer.

15 Rule for adjuſting thermometers to theſe.

As artiſts may be often obliged to adjuſt thermometers under very different preſſures of the atmoſphere, philoſophers have been at pains to diſcover a general rule which might be applied on all occaſions. M. de Luc, in his *Recherches ſur les Mod. de l'Atmoſphere* from a ſeries of experiments, has given an equation for the allowance on account of this difference, in Paris meaſure, which has been verified by Sir George Shuckburgh *; alſo Dr Horſley, Dr Maſkelyne, and Sir George Shuckburgh, have adapted the equation and rules to Engliſh meaſures, and have reduced the allowances into tables for the uſe of the artiſt. Dr Horſley's rule, deduced from De Luc's, is this:

* *Phil. Tranſ.* for 1775 and 1778.

$$\frac{99}{8990000} \log. x - 92.804 = h.$$

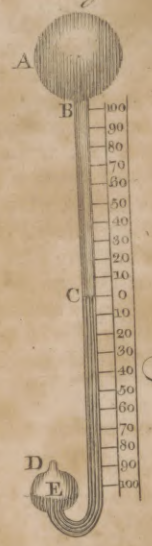
where h denotes the height of a thermometer plunged in boiling water, above the point of melting ice, in degrees of Bird's Fahrenheit, and x the height of the barometer in 10ths of an inch. From this rule he has computed the following table, for finding the heights, to which a good Bird's Fahrenheit will riſe when plunged in boiling water, in all ſtates of the barometer, from 27 to 31 Engliſh inches; which will ſerve, among other uſes, to direct inſtrument-makers in making a true allowance for the effect of the variation of the barometer, if they ſhould be obliged to finiſh a thermometer at a time when the barometer is above or below 30 inches; though it is beſt to fix the boiling point when the barometer is at that height.

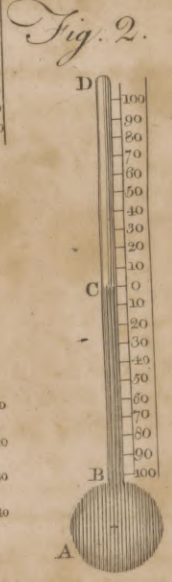
Equation

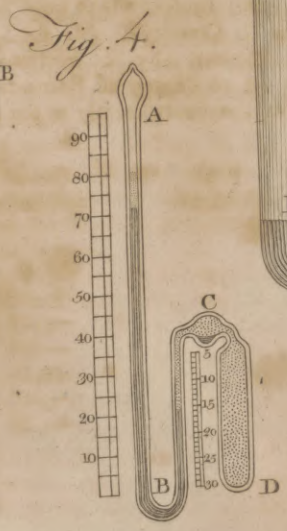
(A) We have affirmed that the expanſions of the bulk of quickſilver by heat are nearly (for they are not ſtrictly ſo) in a regular arithmetical progreſſion, according to the quantity of heat it is expoſed to; and ſuch ſeems to be the caſe according to the Table publiſhed by Mr de Luc, at page 309 of his firſt volume on the Modifications of the Atmoſphere. The following extract of this table ſhows theſe variations: and the firſt and ſecond differences are added, in order to render theſe irregularities more ſenſible. They are ſuch as can hardly be conceived from the nature of any ſubſtance, without the influence of extraneous and accidental cauſes, which may have eſcaped the attention of the obſerver; neither have they been found exactly true by Dr Crawford. Mr de Luc ſuppoſes the whole heat from melting ice to that of boiling water to be divided into 80 parts; by the fractional ſubdiviſions of which he expreſſes the abſolute quantities of heat, anſwering to each 5 or 10 degrees of Reaumur's thermometer (=22,5 of Fahrenheit's ſcale); ſo that the whole ſum of theſe fractions amounts exactly to the aſſumed number 80. They are as follow:

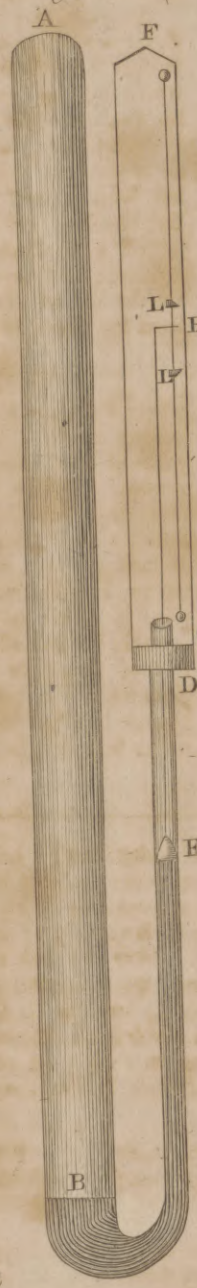
Cronſtedt's Mineralogy, vol. ii.

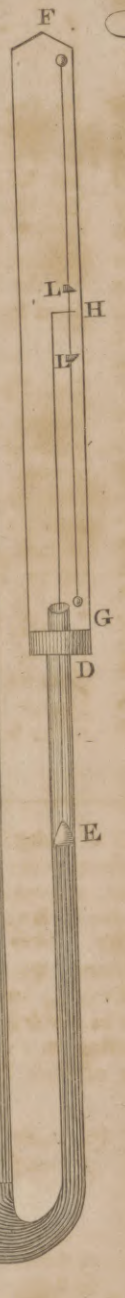
	Reaumur's Thermometer.	*Fahrenheit's Thermometer.*	*Quantities of heat.*	*First differences.*	*Second differences.*
Degrees	80	212			
	70	189.5	9.44	.16	
	60	167	9.60	.10	+ .06
	50	144.5	9.70	.16	— .06
	40	122	9.86	.22	— .06
	30	99.5	10.08	.12	+ .10
	20	77	10.20	.18	— .06
	10	54.5	10.38	.56	— .18
	0	32	10.74		

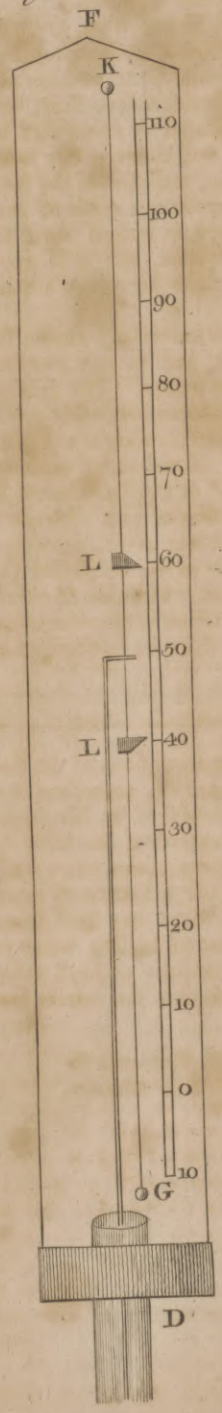


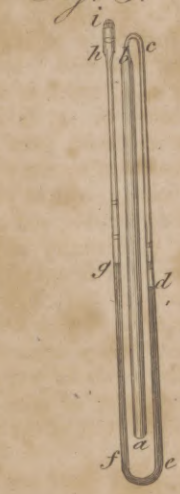


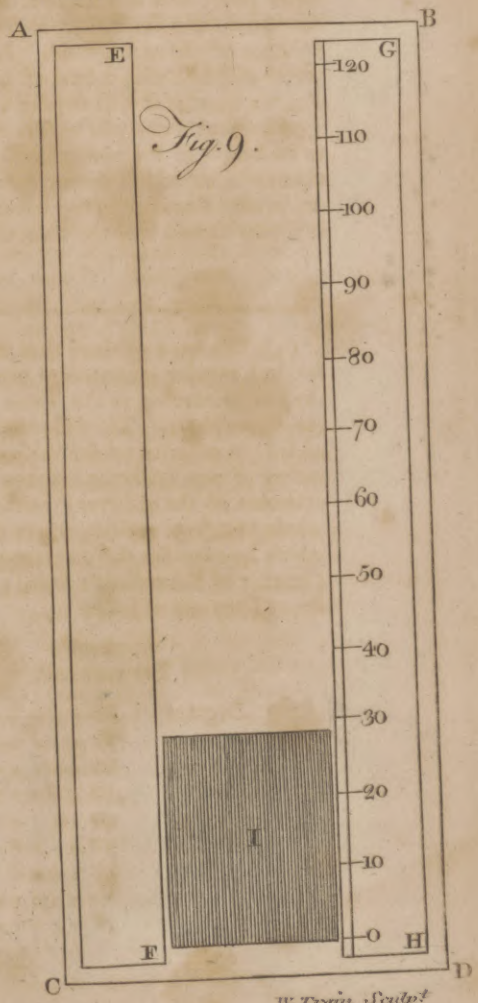




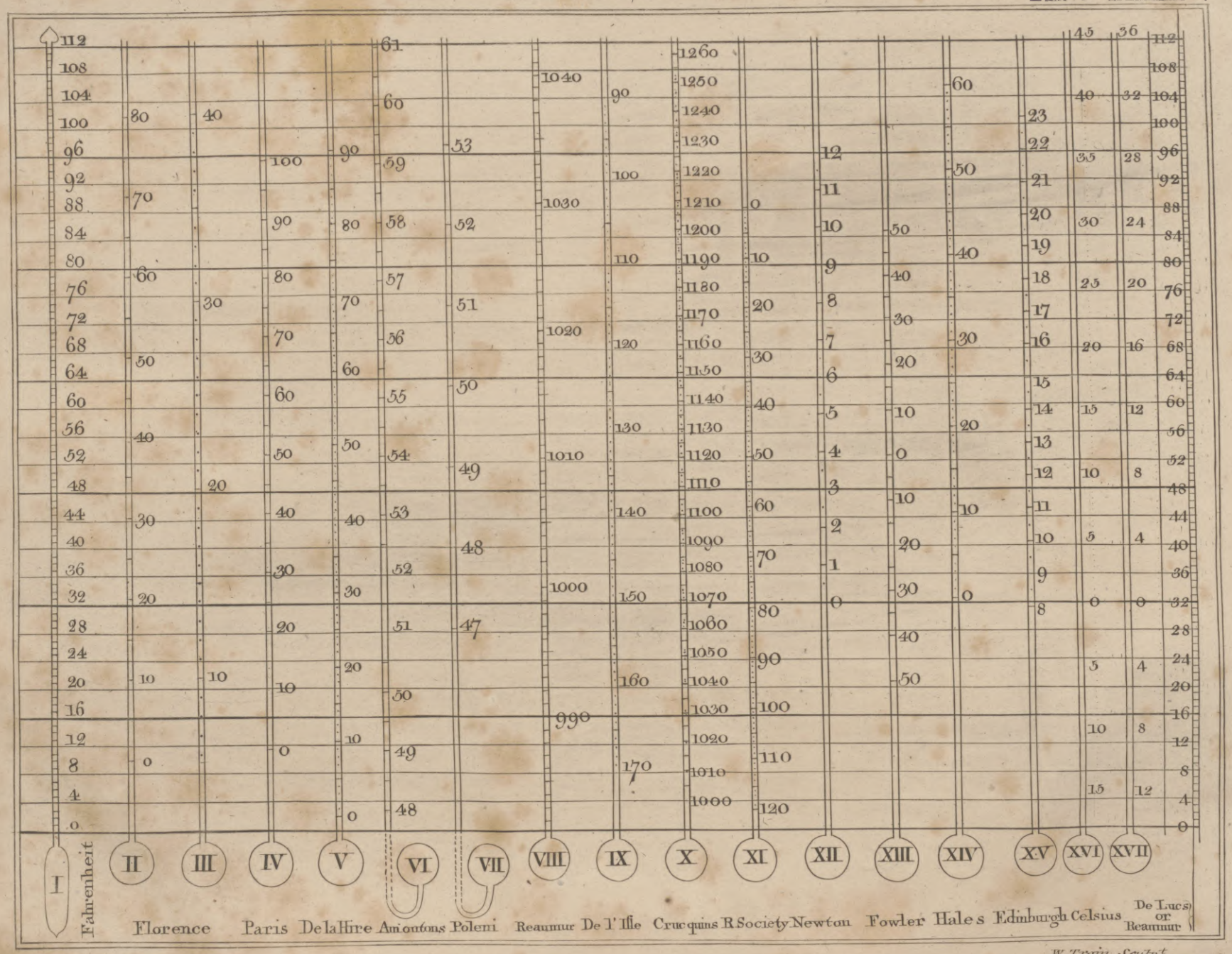








W. Train Sculpt.



W. Train Sculpt.