DE AURO

(on gold)

Pico della Mirandola, fr.

trans: PAT TAHIL

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The Golden Work On Gold, its Merit, its Getting, its Use, To his Spouse

By

J. Fr. Mirandula, Dom. Concordiaeque Comes.

Book 1., Chapter 1.

Gold not known in the earliest times; its discovery and esteem by universal agreement, so that it is the yardstick for other things.

It has often entered my mind, my spouse, to discover more exactly by discussion why gold, that used to be so esteemed, and still is, insinuated its extraordinary reputation into the minds of men, and having done so, fixed it there so tenaciously. I see that it is sought with such great and needless diligence, that it is with good reason that they say the earliest Latin writers derived the name from "turning mens' minds"; and once found, it is guarded so carefully that it gave the Greeks reason to derive the name from "apo to oreoin" because it is watched over more than anything else, and the word "thesaurus" was compounded from it. On the other hand, the mind that is highly desirous of finding the truth has further discovered that although gold may seem to be useful, this is not necessarily because of any of its qualities, but by universal agreement. And it has been recorded in the earliest times that gold was not always esteemed above the other accessories of life, including metals; for the spoken or implicit testimony of all centuries that gold was preferred to the other things I have called accessories of life does not altogether persuade me, because there is no mention of gold among the first works of men, rather it is related in ancient literary records that men lived for many centuries without gold. Nor are there lacking those who wrote that gold was discovered by Aeacus a little before the days of Troy, and silver by Indus the king of Scythia, and those who say it was found by Thoas or Aeaclus, or Erichthonis, or Sol, or Vulcan, or even Chrysus: Hippocrates was of this opinion, saying that the name of gold "ho chrysos" was taken from its finder.

I know that it has been written that gold was not in use in Eurpoe much before it was smelted by the Phoenicians in the time of Cadmus. Why, when Greece was already rich and flourishing not enough gold could be scraped together in the whole of Greece to allow the Amyclaean Apollo to have a gold crown, relates Athenaeus. Finally, it was so rare and dear in the time of King Philip that he considered that he had done well to acquire a golden drinking vessel, which was so small that he could hide it under his pillow, if Durius Samius wrote the truth, whose description of Philip's licentious ways is, I think, taken from Pliny, when he inveighs against Philip's golden cup! So far were the Greeks from cherishing the metal that their laws forbade them to use it. It can be plainly seen from history that Sparta grew and flourished without coins of silver and gold, and that it fell and was ruined when Lysander brought in the golden booty of the captured Athenians. Plato assents; in his "Laws" he forbade any privite person to possess gold, and did the same for silver. Perhaps it came into his head because gold and silver were rarely used in Greece, and were usually seen only in temples, and in tripods and images that the Lydian kings Gyges and Croesus first possessed, and after them the Sicilian tyrants. Soon after the Phocaeans inhabited Delphi the metal began to be commonly used in Greece.

I recall the diminished regard in which the Hebrews held the metal, although they had much of it, preferring bronze to gold, if Josephus reports truly in the seventh and eleventh chapters of his "Antiquities". It also comes to my mind that Spartacus in his camps in Italy forbade anyone to have gold or silver. After it had been in circulation for numberless centuries among certain African and Asian peoples, some of them had little regard for gold, others thought nothing of it, and in India, which is thought to be very rich in it, at least if we are speaking of that part of it that Alexander of Macedon conquered, we learn from the accounts of his deeds by the Greek writers that there was no gold, although when Bersis was sacked the king himself obtained so much gold that thirty thousand mules were scarcely enough to carry it. We therefore infer that certain men agreed not to esteem gold highly, although it is not clear why, and that it was not always agreed and decided by every nation in the world that gold is the measure of other things.

Chapter 2.

Gold not highly esteemed because of its natural usefulness.

I do not bring forward the argument with which some have tried to persuade the common man, that gold is very useful to men. Against it, on the contrary, I cite iron, without which Agriculture could not exist, an art as useful as it is general, (As Xenophon says it is the mother and nurse of all the arts) Architecture could not build, the Navy could not exist, and let me add the Army, which, although it hurts some, does not injure all. I am the first to approve that half-line of poetry, "Gold is more hurtful than iron", also that similar saying, "gold is more precious than iron in war."

The maxim that gold is disapproved of by the best people and leads to ruination in life is close in meaning to these. I have also often recorded how old, how admired and at the same time how unworthy it is; how he who first hoarded gold was deluded is the meaning beneath the fable of Midas; for a heap of gold brings no solid wealth to life. Furthermore, its use in commerce was no powerful reason for the high repute of gold, since the old kings struck coins, not of gold or silver, but of bronze (aes), of which Saturn was the inventor and from which the treasury (aerarium) gets its name, as Cecil the Cyprian thinks, although others write that the first to strike coins was Janus, the contemporary of Saturn, who struck on his coins his guest and the ship that carried him. Among the Romans bronze was the first to be minted, then silver, and gold a few years later, because Servius, the seventh king of the Romans, first struck bronze coins, the consul Fabius was the first to issue silver ones, and soon afterwards gold was used.

Chapter 3.

Gold's extraordinary reputation is not medicinal.

When it comes to the medical faculty, some long-standing Epicheramatan opinions that gold produces gladness and strength in the

bodily temperament have been cited against me; contrary opinions from the same faculty support me, because delight in heaps of golden coins exists only while the rich man is thinking of them, and there are those who take pleasure in spending money, but these are matters of the imagination, the intellect and the mind, not of the bodily temperament, which is unsettled by heavy things and dross. Moreover, there are many things that they say are better for the bodily temperament, and that are recommended by even the doctors of antiquity for the rekindling of human life, whose sufficient powers we can make more or less use of. For no metal nourishes, as the ancient Peripatetics knew, nor are digested, nor turned into flesh and blood. This is proved by the actions of those who were uprooted by the whirlwinds of war and the devastation of their lands, hid themselves in caves and, like Catapotius, buried golden coins inside their bellies, which they were soon recovered, their colour and weight unchanged.

And if perhaps gold perishes and is consumed by the innate heat, it is to a very small extent, otherwise, it would have better preserved the lives of those Jews who fled to Titus Caesar while he was besieging Jerusalem, for if the gold had been digested, or if they had swallowed it to nourish themselves, they would not have been cut up by the avaricious Arabs and Assyrians to extract from their guts the gold they had previously buried in their bellies, and so great was the number of these that two thousand were disembowelled in a single night, according to Josephus, as confirmed by Aegesippus.

These wretches therefore hid the gold in their stomachs as in a chest, not for assuaging hungar, or it would have been diffused throughout the body, and altered, like other foodstuffs. What then? Gold neither soothes with its smell nor nurtures with its taste those vapours that rise from human bodies, called spirits by the doctors, rather all metals have an unpleasant taste and a sulfurous smell, and must be prejudicial to those who fall sick; they are a long way from retaining the departing spirit with their unctuousness. It is the well-known opinion of Albertus Magnus that the tastes and odors of all metals are somewhat unpleasant, although gold has the least smell and therefore the least stench, because of the extreme fineness of the sulfur that is part of its composition. There are, however, those

who hold that not only the smell, but also the taste of metals are helpful to both well and sick persons, but they are of less value than gold. It comes to mind that Pliny wrote that gold was once given to the wounded and children, against poisons, so that they should be less hurtful, and to others to bring them wealth. One also remembers that the same Pliny (if he is to support us) wrote as many reproaches against gold as praises of it. He also wrote that there is a certain poison in gold, and this I remember as his chief conclusion - for who is not interested in Medicine? And if he does not exclude gold, others have later made him their authority for so doing, as is the custom.

He quotes Varro, who was a man of his own time, and an outstanding medic. Dioscorides does not ascribe any medicinal action to gold. I have said that Dioscorides lived at the same time as Varro, following Suidas, and general opinion, although I know that some prefer Dioscorides to have lived in Pliny's times, following Lienius Bassus, but I would rather listen to those who think that Dioscorides lived at the time of Arrius, to whom is attributed a book of medicinal simples: I do not speak of the Arrius whose hopes Catullus laughed at, nor of that bitter enemy of our religion who so obstinately blasphemed Christ the Lord, but of him who was of the same age as Alexdrinus, who was greatly honoured by Augustus Caesar after his victory over Anthony and Cleopatra; but whether Dioscorides is older than Pliny, or a contemporary, seems to matter little. Varro was certainly affected by the Triumvirate; from him Greece, Latium and the Barbarians took their materia medica;we gave it as our opinion that he is later, because Discorides is mentioned by Pliny; he may be earlier, slightly earlier, or, as I think, a contemporary.

Discorides, to whatever century he belonged, handed on many remedies in the appropriate chapters on quicksilver, bronze, iron and lead, but not on gold. And he scarcely mentions mercury, because it is harmful if ingested. Small pieces of gold remedy the harm it does; this he mentions when treating of other medicines. When he is speaking of poisons, he says that aconite is combatted with pure wine in which red-hot gold has been quenched, but this property is not peculiar to it, but shared with a mixture of silver, iron, and iron slag, which is just as good, and is recommended by Paul of Aegina

when he deals with poisons. Galenus, very much later than Discorides, treats of the power of simple medicines also, gives the same recipes, and says as much about gold as I have. I remember that Alexander of Colophon in his Alexipharmax writes that gold and silver are useful, but his testimony is not so strong as to be legitimately quoted in this context, either because he was a poet, or because he copied Dioscorides and Galen, or because he equated gold with silver, writing "enoiemati tholero"; it matters little. For he says that the metal should be made into a turbid liquid and then drunk; I do not deny that gold may have some medicinal value, but I ask you how much?

Also considering, that there are innumerable remedies that have some power of healing or of fighting poison; one may make the same judgement concerning silver. And if they have no medical power, nor bring pleasure, whence, I ask you comes this general piling-up of gold and silver vessels, sought with great labour? For it seems that tables, or at least vessels, made of silver denote nobility; Vitruvius, however, in his eighth book dealing with water, when he comes to the end, and shows that lead is harmful because water is infected by lead pipes, adds clearly that the taste of silver is harmful; so those who have tables made of their silver vessels, use earthenware because of the soundness of their taste. Many princes of our own tempestuous times are in agreement, turn their unvalued bowls and dishes into silver tables, and prefer for their elegant banquets earthenware dishes brought from India, Ethiopia and Egypt, or, if these are lacking, form Bythinia, though they may not have potters as fathers, like the man praised by Agathocles, who preferred vessels of Samian ware to silver. Even the triumvir Anthony, who at Mesalla's instigation used only gold to gratify all his obscene desires, does not seem to have liked the taste of gold. Nero's Poppaea also seems to have rejected it, for she had golden shoes made for her best animals. I know what the Arab physicians have written, that although gold does not nourish, it soothes the eyes. I would add that its imaginary power can be explained reasonably, for is it not so highly esteemed as to be made the measure of all things? Is it not natural for riches to make the heart tremble? It does not follow, as we have said before, that Nicander's words are vain.

Chapter 4.

Potable gold does not explain the great nobleness of the Metal.

They say that the use of potable gold leads to the alleviation of illnesses, the preservation of health, and the lengthening of life, as far as nature allows; this I shall consider, not as settled, but as a matter for argument. In confirmation of this, I assert that it is a matter of controversy among those who are skilled in debate. Perhaps those who drink up gold agree that it is not really gold that is drunk, but its pure and subtle portion, called the conjunct essence.

Indeed, how many battles concerning that quintessence of higher substances have been sought by the great leaders of philosophy. Their followers still fight to-day, and the Platonist, and the Peripatetics (whose founder they say wished for the quintessence, rather than proved its existence) do not agree as to who has the victory; they allow that the theory of five substances has some foundation, but they do not allow that they are heavenly lest they should have to conceide that they are composed of sublunary elements. For whether they make potable gold from honey, or sulfur, or quicksilver, or distilled pure water, or some secret earth, or, if you prefer, from some exalted kind of copper, much refined, they will say that some subtle power is drawn from it. They will not agree that the quintessence is drawn from it, and if they say that the quintessence is built up from the qualities of the elements, which they cannot predict will be found in it, one can readily reply that they are contending that the Peripatetics take the appearance for the reality, and attribute effects which something else could have caused to the concurrence of diverse causes and their contraction into one. Finally, if they concede this to the Peripatetics, why do they not enunciate that other dogma, that animals cannot live on metals? In order to leave the end of the controversy to doctors quarrelling among themselves, they bring forward all sorts of reasons why the investigation of potable gold is being persued to this day; this has nothing to do with drinking gold itself. For it is clear that they are accustomed to reduce gold to

an ash, or a calx, as they prefer to call it, which is done in many ways, so as to reduce it finally to its pristine form, when perhaps you may drink it, or not at all, or hardly, if its moisture has departed, for if you remove it thoroughly, you have destroyed the gold. It has been declared by Aristotle and Theophrastus that moisture is a constituent of all metals that forms part of their nature and separates them from being stones.

Therefore they add that it is not gold that is drunk, but a part of it, that was once gold, dissolved in a foreign liquid, which has the power not only of sweetening and weakening the calx of gold, but also of extracting something that can be drunk; they say the same of gems, which cannot themselves be drunk, as everyone knows; defenders of this viewpoint say that there are several ways of liquefying gold, and that you should not believe what their opponents say; moreover they assert that it is done by corroding waters, the addition of various kinds of salt, or by biting juices, so that the power that nature bestowed on gold is taken from gold and lifted from its seat, therefore everyone must allow that it happens, especially as it becomes more fitted for nourishing human nature. Now whether you are speaking of the nature of gold itself, which is not fit for eating, as we knew from the Peripatetics, or whether you are speaking of its nature when mixed (which they say is not gold in their judgement), it is agreed that one is drinking a liquid that has flowed drop by drop from a glass vessel as the vapours carried up by the heat of the fire turned back into water, and was mixed with other substances sought from the rest of the medical faculty; if this is drinking gold or drinking gems, why do they not say they who drink wine drawn from a soil fattened by a mixture of various excrements are drinking excrements?

I have supported the cause of those who would allow potable gold because I think something can be collected that can be very helpful for our bodies and those of others, especially as everyone agrees that our surgeon Antonius in years gone by restored a marriad woman of Cornelius' house who was dying of consumption to health in a few days, free from her wasting disease, solely by the use of potable gold This was learnt from her uncle Nicholas, whom I shall mention in Book Three, and I shall speak further of the matter in those volumes I have written on antidotes to poisons that I am printing now. But if I can

say that it is gold that is helpful to health, does there remain in it the nobility of gold, and is there still the same great hunger and desire for it? One pound of that metal dissolved into a liquid can cure not merely a king, but a kingdom, but amongst ten thousand thousand (ten million?) mortals you will scarcely find fifteen who seek potabile gold, and among those fifteen scarcely two who know how to make potions of gold and are knowledgeable about them.

Chapter 5.
The purity and permanence of gold are not the reason men rate it so highly.

If one believes that the purity of gold gives it its particular importance, we find here a fallacy, for although it is fouled and tinged less than other metals, still, it is tinged and defiled by sulfur, which mingles not only with its properties, but with its very substance, as Albertus writes, and perhaps it is for that reason that Hermes spoke of gold to the Egyptians under the name of sulfur. Shall I ask whether gold or glass is the purer? Therefore that Roman leader was afraid that he might be swayed, so that he began with a hammer, and continued, to reduce gold to its original condition, and the road was choked with goods made of all sorts of metal.

It is famous for its permanence, but it comes to mind that stones are more permanent, and are more precious, for they feel neither water nor fire, nor do they give rise to slag, nor are they spotted by dirt though they cannot avoid it if they are rubbed for a long time. Stone do not melt, but gold does, is not this a common property of all metals? After they had come into use as coins, as a security when trading goods, gold was employed later than bronze and silver, and this seems to detract from its importance and usefulness. For we recollec saying that it had been recorded that in Rome King Servius was the first to make coins from bronze, and that the Roman people did not even have silver coins before the war with Pyrrhus, sixty years after the founding of the city. Because we are told that it was during the consulship of Fabius that gold was minted, and sixty years later,

the Romans ordered conquered Carthage and the other nations to pay tribute in silver, not gold, so that neither the permanence nor usefulness of the metal can be a cause (for its importance). Gold and silver coins were longer in use among external nations, like the Cisalpine Gauls, who called silver by the name of "pecunia signata" (coined wealth); it was less esteemed by Plato, prince of philosophers, for he laid down a law that no citizens in his state should use precious coins, but such as were despised by other peoples, so that they did not go mad gathering gold and silver. And this perhaps is why the lyric poet sings that gold is useless and the root of all evil.

Chapter 6.

Its brightness is not the reason why gold exceeds all else in value, whether because it delights the eyes, or because it does not wear away nor rub off.

But the gentle colour of gold attracts and dazzles the eyes. Pliny denies this, and makes silver brighter, for it is more like the day and military insignia, for it shines further and in a more familiar way. Gold is not thought better than all the other metals because its colour resembles the stars, for that colour is not remarkable for its presence in gems and other things; some think that gold outshines all the rest because it is the colour of dawn (aurora), from which some would like to think gold (aurum) took its name; Why? It is easily learnt that the word was translated from the language of the Sabines, who said "ausum", by the alteration of one letter, as many good authors say. However that may be, silver delighted Pliny's eyes more than gold; one cannot blame him for believing what he wrote, but he should be censured for saying that lead is heavier than gold; later experiments disprove this. While he says that gold is very little worn away by use, one should remember that golden rings and coins are worn away by the rubbing of the fingers, and though it is very little, it is not nothing. There are those who think that gold is not damaged by heat, relying on the authority of

of Aristotle, third chapter of "Meteorics", but this is not reliable testimony, or not properly understood, for experiment convinces us that gold does lose weight when strongly heated for a long time. It is recorded, and proved in our own day, that gold disappears if placed on the fire with a dust "that abounds in mills both rural and urban"; likewise gold loses its yellow colour after a small amount of use by man, nor can the colour be restored once lost and gold that retains its colour loses its golden red shine if dust is thrown on it.

Gold can be beaten out thinly, and woven into textiles; this it has in common with silver. Finally, to dally no longer, I have not been able to find any solid cause why folk might have valid reason for esteeming gold so highly, and for pursuing it so eagerly that after their deaths it is placed in hollow mountains with them; some have it put down in the deepest caves, called mineshafts, with themselves, others strive to collect it from the tributaries of rivers, others from the farthest shores of India, or the sun-burned sands of Ethiopia, or sail with the West Wind to the regions of the dawn and the antipodes; they even adorn themselves not only with gold, or obrizum - to use the Greek word - mixed with a kind of colophony, as the Parisians do to-day, but with gold in its crude and unworked state. So you will not easily find a reason to satisfy the man desirous of knowing the nature of things as to why there is such a great desire for it (when its usefulness does not equal its worth), that the greater part of humanity measures all things human by it; would that matters divine were not measured by the same measure!

Chapter 7.
The extraordinary nobility of gold does not stem from sacred literature.

The belief in the preciousness of gold and the long duration of that belief do not stem from sacred literature. For even if we read in it that many objects necessary for worship in the Jewish temple were divinely ordered to be made from pure gold; and we likewise know that the Prophet sang "He will be given gold of Arabia"; even so we

ought to remember that we have recorded Josephus' testimony that bronze was somewhat better than gold, for the vessel called the great sea, found among the spoils of David in Solomon's temple, was made of it. Esdras, in Xerxes' times, restored to their custodians the bronze vessels that weighed twelve talents and were considered better than gold, using monies given by the priests. We should also realise that in the mystic pages of Holy Writ wisdom is signified by gold, speech by silver, and the light of intelligence is thought brighter than gold; so they do not tell us what is recorded in literature, that there is an earthy fatness, like gold, that occurs in Arabia, pure by nature without the intervention of fire, and therefore called "apyron", as Diodorus tells us. I need not say that God in his goodness has lowered himself to the level of human frailty in many matters of general use to man (as Chrysostom says), for these gifts are poured out to the present day. What? You may find in that same Holy Writ that gold was often rejected and despised, see Hosea the Prophet, where they made themselves idols of gold, or Peter the Apostle, who called gold and silver corruptible, or Jacob, who wrote that gold rusts, so that truly no small wonder is born in the minds of cool judges of affairs as to where such greed came from, for by nature it is not useful, or hardly, or not very, besides, things made of gold have much in common with other things, and gold is much inferior to many things that are measured against it.

Chapter 8.

The nobility of gold does not stem from the favour shown those who wear it.

Who indeed is so stupid as to believe that those who seek gold hope to curry favour by displaying it? For it is recorded in certain foolish old manuscripts that they used to make an ointment from gold that had not experienced the fire, the use of which, magicians claimed, rendered the wearer as popular as those who were crowned with the herb helichrysum; but it seems to me that spending gold

freely does not bring popularity by its bestowal, but rather, far from encouraging love and kindness, kindles envy in return for accumulated heaps of golden coins. Moreover, who is so steeped in the empty vanities of mortals that he knows how to make that golden ointment, or, knowing how, makes it? How many, either in antiquity or to-day, seek gold for that reason, or if they do, whom will you find popular with the masses because he is crowned with the herb helichrysum, or anointed with metal that has not been fired, or who is loved for his regal dwelling?

Whence comes such greed for gold that men are compelled by no obvious cause to prefer gold before all else, beyond the bond of a mere tacit and unnecessary agreement (would that it were not a pernicious one!). Nor are they content with Dalmatian caves and Callaian grottoes, and the goldbearing sands of river pools, nor with the sea journeys that have been made since the time of Solomon to seek gold, but seek to make it by art; the labours that have been undertaken at home to make gold are not less nor fewer than the wars and journeys undertaken for native gold; for we see many who not only eagerly undertake manual labor to prepare gold from metallic substances, or study the singular opinions of the philosophers in order to make dusts and stones productive of gold, whether these are mineral (to use the common term, which should be "metals" in Latin) or vegetable, that is made from herbs and shoots, or animal, that is, made from beings with souls, or a mixture of two or three of them, or whether composed from some earthy or airy substance, from which metals, vegetables and animals arise. I have heard that there is living a man who boasted that he had read eighty volumes on the art, and had written unnumbered sheets to the number of thirty seven thousand, certainly not to gain popularity by displaying them, but to have what he desired, having gathered what he pleased. So great is the diligence in collecting gold, for no reason (or only a weak one) beyond the bare tacit agreement of wretched mortals!

J. Fr. Pico Mirandula
Second book on gold, to his wife.

Chapter 1.
What gold & silver are, and of the name of the art by which is made.

So far we have spoken of the love of gold. Now we must discuss how it may be made, for the question "Can it be made, or can it not" is tossed about by the learned and the ignorant and is the subject of many debates, therefore the considerable usefulness of reducing their strength, or at least of generally calming them, not in minute detail, but in general, beckoned me on; for it is to the benefit of the state of man if matters commonly talked of and kept before everyone's attention are resolved without doubt.

We shall show that the name, the origin and the power of the art have been long and widely discussed by the literary schools. The art of making gold was called "Chrysopoeia" by the Greeks, the Romans called it by the same name, and the art of making metals in general was called "Chemia" by the Greeks; most of the Arabs followed them, calling it "Alchemia." The Greeks, moreover, defined Chemia as the means of making gold and silver. For although other metals were made by it, it took its name from the most noble and excellent, so it was called "argyropoiea" and later "Chrysopoiea."

There are those who thought Chemia was named from saps and juices, with whom Hermolaus appears to agree, but it is more likely to be from "fusing" which is the final function of the art, and the Greek letter H (rendered as long E in Latin) gives strength to the argument that it comes from matters to do with fusion; it is well enough agreed that it can be called the metallic art. Metal workers are judged useful to the state and it is so stated in the laws, because they give employment in preparing gold and silver as a further result of the matter (making gold). Expounders of the law used to employ the name of a common metal to cover others, so it pleased them to indicate golden coins by the word "bronze", as Ulpianus writes. I do not mention those who, for no reason that I can think of, would derive

(chemistry) from "alchemy", and I am surprised that Erasmus, a widely-read man, taught this in the dialogue that he called alchemical. I am surprised, I say, that he followed the common opinion, and did not recognize that the article "al" was used by the Arabs, and that he removed the aspiration, which ought to be included, whether the word is derived from founding, or the power of making of saps and juices. I wonder more, rather than less, at Erasmus, who can in no way be excused for rejecting the name, and thinking up some unusual word.

Chapter 2.
The origins and progress of the art.

Vincent of Beauvais traces the beginning of the art from the first parent of the human race through various intermediaries to others and to the apostolic Dominican from whom he says he learnt many things. Others would have it that Hermes Trismegistus first executed chemical writings on tablets of stone that were discovered in the city of Hebron. Nor are there wanting those who write that it was divinely revealed in the desert of Sinai to some Hebrew in a way similar to that in which the covenant of the tabernacle was set up.

As far as I can gather from the Greek and Latin writers. I have found that the art is certainly very old, and dates to shortly before the Trojan War, for it is mentioned by the oldest Greeks, under the cloudy wraps of story and riddles; thus Michael Psellus interprets the desire of Eurystheus for the golden apples, and Suidas says that the voyage of Jason to Colchis does not concern the golden fleece of Phrixus, but a ramskin parchment in which the art of making gold is described, for which the Argonauts searched, although it does not escape me that Varro says it was cattle hides - Strabo calls them hairy sheepskins - with which gold was collected from river tributaries. For many of the older Greeks, recounters of the voyage to Colchis, among whom are Charax and Apollonius and later Eustatnius in his story of the matter, had it that it was a parchment, not a skin, nor the hairy hides of cattle, and to the present day there are many

writers who consider that under the fabulous cover of the golden fleece is hidden a description of the art of making gold. So should Atreus' lamp be considered, of which the Greek writers of tragedies and the Romans whom Cicero recalls speak, though Seneca indeed calls it a ram, not a lamb; so, I say, many interpret the ram or lamb of Atreus so as to hint to the readers that it is a description of the art of making gold.

For Callisthenes Olynthius, relative and disciple of Aristotle, informs us that the wealth of Atreus and Pelops arose from metals, although others follow the example of Varro in deriving it from flocks and heards on the hoof. Others derive it from silver vessels on which designs were chased. For the word "arvon" or "lamb" is contained in it (Gr, "argyros", silver). Otherwise, the art of making gold is naturally accepted by Greek authors, though whether it spread from the Persians, the Egyptians, or the rest of those nations that are near the East. I have not been able to determine, although Hostanes in Persia and Tamorus in Egypt handed it down that Hermes wrote Chemistry, and continued the practice of chrysopoiea in Egypt; that great riches were produced by it down to the time of Diocletian, the Greek books that contain the deeds of Diocletian and Maximinian agree; and it is stated twice in Suidas works, and I have also found that Democritus was the first Greek influenced by the chemical art from Egypt in the east, and learned much from the Persians and the Indians; it is, I say, the same Democritus whom Hippocrates admired, whom even Thimo praised, whom Plato did not dare attack, and who was called a man of great renown by Celsus. From him arose the Democritan sect, also called the Abderans. Michael Psellus is not the only commentator on Aristotle whom I recall; he revealed his secrets. He also afterwards wrote on Rhetoric, History, Physics, Mathematics and Chemistry, and Medicine, and dedicated his works to the Emperor Constantine.

Olympiodorus the Platonist from Alexandria and expounder of Aristotle wrote chemical works, so did Heliodorus to the Emperor Theodosius, and Stephanos to Heraclius Caesar, there was Cynesius Africanus, Theophilus, and others; in particular there was Zosimos, the Alexandrian, who composed thirty-two volumes of the art. The teachings of all of them can clearly be referred back to Democritus, who was a most expert investigator of nature, and enjoyed a very long life. For he

lived more than a hundred years, and knew many things that were hidden to the commonalty of readers; he also wrote his precepts rather obscurely, so that he did not seem to know Chemistry.

It is true that his precepts were known only to his colleagues and friends, and unknown to the masses, and that he afterwards approved those headings from which those who already knew of the matter in some other way could understand it. Therefore I can only wonder at Hermolaus Barbarus, a man of otherwise good literary reputation, for writing that Democritus and all his school are damned and, whether from malice or arrogance, taking credit for it. He could have remembered that in antiquity even from Homer's time different names were given to the same thing, and the upper and lower classes used to employ different words, and the priests did not use the same words as the ordinary people; and indeed it is easy to find it recorded (something I do not doubt he knew) that it was considered very praiseworthy and was practised in particular by all the sects that the philosophers considered important, so that they hid their dogmas, especially the Pythagoreans and the Heraclitans, for they employed silence and symbols, because Plato wrote in riddles, and they replied with further riddles to those who sought clarification of the enigmas.

Plato also hid his doctrines under many veils, imitating the Syrians of Palestine, whose custom it was, according to the author Jerome, to use parables, nor shall I mention countless others who could refute Barbarus, nor use them as a defence against what he has published, except to say he should have emended what he incautiously said with the corollary "The early teachers of wisdom kept their philosophies secret, so that they should not become known to the profane multitude."

After the decline of the Roman Empire Greece was depopulated and Italy devastated by frequent barbarian invasions; then they received inhabitants and the beginnings of literature from the Moors and peoples of Arabia, into whose language many chemical books were translated, and from these the Moors, especially those who lived in Baetica, compiled other books, nor did they reject the work itself, though expensive. Then Avicenna and Rhasis, and Geber, and finally a numerous assembly of Arabian philosophers wrote volumes on chemical matters; they were later followed by Vincentius and Albertus Magnus and many

others. But these writings were not well-known, till Arnold of Villa Nova in hither Spain, and later Raymond the Baleric islander resurrected a theme in danger of being forgotten by much writings, many inventions, and public experiments, and made it better known than in previous centuries, and whether because he was more learned, or better versed in matters concerning meteorics from arguing with the Peripatetics, or a little more curious in exploring nature, or because he was a little keener to make gold, he seized the opportunity to dedicate himself to learning and teaching the work of the transmutation of metals. However, you will find few of the later followers of Aristotle after Timon speaking of the art.

I find that he supported the art by numerous experiments, and so did a great number of his companions. So great was the rush that the art spread even to the unskilled masses. Thence arose foolish and empty ideas, and it began to be doubted whether the art and the promise of making gold were true or false, for it was observed that inherited money was lost through empty promises, and from loss of patrimony it was easy to fall into the crime of stealing money. For this reason, Hermolaus tells us, it was at one time forbidden in Venice for anyone to make gold, and for the same reasons.

Those whose opinions were formed by the Christian religion argued much as to whether the craft should be allowed or not, and what was lawful and what unlawful. This often occurs when unscrupulous teachers of some doctrine increase in number, or when they teach in a depraved manner what is otherwise legitimate. So the rhetoricians were once expelled from Sparta, and from Rome not only the rhetoricians, but also doctors and philosophers.

There is, however, no doubt that this art, also called Chrysopoiea by the Greeks, should be counted among allowable studies. However, it is the opinion of the priests that the art is of great assistance to nature because it produces gold, while the natural philosophers believe that artifical gold would be useful if only it could be made suitable for human beings, whereupon doctors would immediately seek it out. But the art should only be believed as far as it can be proved by experiments. Of these we have not only hearsay evidence, but the eye witness testimony of princes and paupers; it is also studied by the commonalty of the learned. Of these and other relevant matters we are about to speak.

Chapter III.

Concerning the art itself, is it lawful or not? What the founders, commentators, and interpreters of the laws and canons, the theologians, and the writers of common compendia have said.

The founding fathers and interpreters of civil and canon law and those who like to make epitomes on all questions of conscience from the rulings and doctrines of theologians, and writers on various matters know of the making of gold and have judged and reported in their writings. Of the founding fathers we shall speak later, but of the commentators now.

Bishop William Minatensis, in the appendices to his celebrated work "Speculum juris", declares that "the making of gold is a true and legitimate art, useful for the State", which opinion is supported by John Oldradus and Nicholas Panormitanus and others. Those former laws of Valentine Caesar in Justinian's codex where it speaks of Metal workers persuade the lawyers and interpreters of canon law of this. We shall show in this volume that these laws were neither viewed rightly by ordinary commentators nor completely disapproved of by later ones, since mention is made of experiment, and perhaps Accursius Florentinus, who added glosses to the civil laws, if anyone reads them, will convince us; I have read his comments on the magistery of the art; the precepts he expounded, always under his own name, show he approved of the art, nor should his digest be otherwise interpreted

Angelus Clavasinus deprecates the art in his compendium, while the author of a treatise of the same order called Rossella seems to regard it lightly, rather than inpugn it, and speaks of Angelus' digest as if he thought the art was in the hands of rogues, rather than disapproving of it. John Ligur and Sylvester of the aforesaid order openly marshal arguments attacking Clavasinus with many reasons in the digests of their books called A. Thomas Cajetanus both in his compendia and his theological commentaries comes out for the truth of the art, as we shall soon show.

The celebrated theologians Albertus and Thomas favour the art in their works, although in the case of Thomas' opinions there could be

some dissension between commentators and ourselves, as will be shown in due course. Albertus Magnus, although he wrote much on the transmutation of metals and believed in the art, asserted three especial points among many.

The first was, "They who think the kinds of metal cannot be transmuted are mistaken"; the same things should be credited to Aristotle as are credited to Avicenna. Next he says that this transmutation refers to the prime material of metals which can be turned into various kinds of metal by the aid of the art. Finally Albertus concludes at length that they who are skilled in the art proceed like doctors, and that the most probable path belongs to those who purify sulfur and argent vive and prepare a proper mixture of them, by whose power, if I may use his own words, all kinds of metal are produced; and he finally writes that mercury may be hardened and thence drawn into the shapes of the various metals.

Saint Thomas in the second volume of "Summa Theologica", part two, affirms the truth of Chemistry, which he did not do in his second commentary of theological judgements, therefore many see the matter differently, as will appear in due course when we interpret his opinions fully. At the present day Silvester, Thomas' follower, is of the same opinion, that "gold may be made by the art", with which opinion John Ligur does not agree. But Thomas Cajetanus in his digest says "As long as the art is practised without fraud it should not be considered unlawful of itself, nor, as long as this applies, should the sale of things manufactured by the art be numbered among sins, that is, sale is proper." In his commentaries on St. Thomas" "Summa Theologica" he writes that the art is indeed possible, but is either not human, or is for princes and when he had consulted the authorities he did not enlarge on the power of the art, as he usually, and acutely, does on other questions.

Many wonder that a man who was convinced of the truth of the art by St. Thomas authority and reasoning, should limit the possibilities. For Thomas' reasoning demonstrates that if he allowed it, why should it not be human? And if princes and the wise men they consulted can do it, why is it beyond man, as if princes and the wise were not to be accounted men? Nevertheless, Plato by all means required them for the good of the State, that is, either that princes should

practise philosophy, or that philosophers should administer the State. For this reason Cajetanus can be defended against censure, for there are few princes who are experienced in the ways of nature, and most princes who have leisure for chemistry lack the means, therefore they are unable, unless they have princely wealth, to do those experiments that require great expense. To this censure my uncle Jo. Pico replied when his brother Antonius was asked his opinion whether or not gold could be artificially made, saying to the enquirer that it could indeed be done, but with great difficulty.

There is no doubt that St. Thomas in his Theologica,which death prevented him from finishing, decided that the art of making gold should be believed if more things could be made besides gold by the art, as we are about to say, and he proposed the same in the commentaries he wrote on Severinus' book on the Trinity, saying it was a lawful art and a subordinate part of natural philosophy, as the juniors say. I have read besides St. Thomas' book on the metallic art - if the title does not lie about the author - it seems to be genuine for it mentions Albertus as teacher and it is addressed to Reginald, to whom it is agreed Thomas sent other writings. I have also read Thomas' opinions on the making of gold and silver in his commentaries. It seems to me that many who know little of chemistry search out something foreign, or rather pluck from their uneducated depths I know not what notions, and avoid mentioning the name of alchemy to the common people, in case abuse should be heaped upon it, as we have hinted previously.

It is true that Erasmus wrote that it is a capital offence if anyone (I quote his words) practises alchemy without his bishop's permission. Most of those given to the art will not praise him, least of all those who have experimented for a long time. First they ask this man, learned as he is. Are there not many bishops under one supreme one, and many under kings who are most unwilling to submit to the Roman Bishop himself? Then they ask whether any bishop should abolish with his own private edict those laws of Caesar concerning metal workers, published so long ago. They say also that such an edict should be promulgated through all provinces, and having been promulgated, should be studied and confirmed according to custom, otherwise it will be considered antiquated and foolish; they also

ask if Pope John 22nd made a secret of his chemistry, which proved a deception regarding gold and silver.

Alligerius Etruscas reminds us of the same. He asked the uneducated and illiterate about the transmutation of metals; and he finally, whether by some excellent idea, or certain experiments, clearly made silver and gold, whether from their first principles or from imperfect metals. From the definition of a just law they have argued that neither the doctors of theology nor the interpreters of the canon can forbid it, for it must be accounted an unjust law that excludes a thing because it is uncommon, and prohibits, forbids and keeps away what is of advantage to many; for it would be a strangulation of justice and honesty to restrain hands that are ready and able to work to their own advantage and that of others; the power given to men is conformable to divine power if it helps, aids, and assists what is useful for men; it is not conformable if it abuses that intention and plainly lacks all force, as those who are learned in the scriptures know beyond doubt, and I may mention that they who make the civil laws do not act so, unless they observe the prescribed conditions.

These are the things that will be asked and enquired of Erasmus, unless one considers that he wrote in joke rather than seriously, and that he was laughing at those who are greedy to make gold, or too credulous of imposters, of whom there is a great number, even more because they think the laws are silent or asleep, and he could also be asked why he solved the question under consideration by a foreign authority, because in the book that Accursius glossed it is written that princes who are gold-makers may, when striving for private ends, do good for the State, so long as they act with care. John the 22nd's edict is of this sort, because it was not received as part of the body of the laws in the seven volumes of the laws, but remained "in fortis", and was not embodied in the Decretals, but he did not dislike the art. Those who blindly use this edict as an argument should come to their senses, and be warned that in a rubric to that very edict the crime of falsification is proscribed, but that we speak of the true art, which cannot be taxed with the name of falsity, nor be dragged before any tribunal, for anyone who follows them correctly sees that Accursius, William and the others speak at length of the crime of falsification.

Unless some falsehood either in material or its presentation is discovered, no kind of penalty can be inflicted, as Baldus says in his "Usus feudorum" when mentioning service to the crown. Further on in the bishop's sermon, it becomes clearer that he is against lying imposters and false artificers, when he writes that alchemists promise riches to the poor which they do not produce, and claim a lie, namely that, contrary to nature, true gold and silver are made by a spurious transmutation. Therefore it is ordered that they who make false money from gold that is spurious and not genuine should be forced to deposit for the public benefit of the poor as much real gold as they sold or gave in payment in spurious gold, and have their goods seized and be sent to prison. We have given this summary of the edict concerning artificers who are false and not genuine almost in the word in which it was written.

Chapter 4.
Proper opinions on the art of making gold depend on natural philosophy.

Moreover,it does not depend on the edicts of princes, nor the interpreters of the laws and canons, nor on those who fill their pages with the words of others and dilate on human customs, but on the principles of natural philosophy in general; so may something not be made by art which nature elsewhere promises, and may it not be possible to make the same form, substance and essence sprung from different origins?

The question of mutation of form arises from the contentions of philosophers about alteration of species and whether they can be changed indiscriminately. The argument about making gold arises in particular from Aristotle's "Meteorics", which treats of various things but not so clearly that firm and certain axioms can be drawn from them Therefore there are those who mock the art, whom Avicenna, Geber and many others stoutly resist, although Avicenna denies that fresh species can be produced through transmutation, he confesses that they can be reduced to a common form. This certainly is one of Aristotle's concerns, except that he does not mention it exactly in those writings that are thought to be genuine. There are certain things in

Aristotelian teaching that favour the art, and besides, I can say with certainty that he speaks only generally of metals in "Meteorics", saying that they mostly arise from moist vapours, as stones and sulfur and sandaraca generally do from dry ones, and there is a certain proportion of them that does not inhabit the caverns of the earth, but are sublimed to the region of the air, therefore they are called by the Greek word "meteor"; he says that clouds and rains are concretions of the moist exhalations, and from the dry fiery ones winds, lightning, thunder, and that kind of thing are produced, tho' he does not discriminate much between them. There is not much clear evidence beyond this in his books, nor does he express any exact teaching, since in the beginning he says there are many things upon which he will not decide, and the commentator Alexander says it is difficult to know what Aristotle was writing about in this work.

Olimpiodorus writes at length and obscurely, but you can easily understand from either of them something both of Aristotle's doctrine and the difficulty of chemistry; for Aristotle, learned as he was, said he was not sure, and treated some things superficially, in a manner that agrees with his perception of them. But from Theophrastus one may glean what will end controversy. For although he wrote of stones in his book, he discoursed of metals too, saying that although they were all worn away by the tooth of time, they are nevertheless composed of water, as stones are composed of earth, hence these are his words, "hydratos men ta metalliyomena, kata pir argyron kai chrysos", which indicate clearly enough that gold is made by experienced artificers, for he tells us that Callias the Athenian made cinnabar, when he thought he was making gold. Now unless he had hoped to make gold from that scarlet sand, he would not have laboured at the task. For it is known that the sand called Chrysamos used to be made into gold, as it used to be dug from the earth, if the civil laws are read properly. As our work progresses, we shall instruct the less skilled in this matter, for if Callias did not attain to gold, but only cinnabar, he had beyond doubt obtained the beginnings of gold.

Because skilled artificers agree that the beginnings of cinnabar, silver and gold are hidden, we may learn something from his co-disciple Callisthenes, and from Theophrastus himself, who taught

according to Aristotle; from their opinions metals can alternate between themselves, since Callisthenes ascribes a single form to them, which Galen admits, arguing from several premisses that they differ only in externals - if this book is really to be considered one of Galen's. I can agree with Callisthenes in this matter when he says that he has frequently experienced that grains of gold by themselves and grains of silver by themselves produce one and the same medicine; likewise I have often seen gold and silver together at the same time in the same medicine, and when I have examined what has fallen out of gold when treated with what is commonly call the "water of partition", and tested it, it plainly contained much gold, but we shall cover experiments more carefully in their place.

Vincent of Burgundy who wrote many volumes, covering nearly all that has been written concerning nature, asserts that he regards the art rather as the separation of gold, though he also says that it can indeed be made, influenced perhaps by his experience of the matter, for he observes that it lies hidden in the other metals. Many others contend that it can only be separated - which cannot be denied - but that it can be born and made, producing many reasons from philosophy. I indeed know Michael Psellus, a Greek commentator on Aristotle, who asserted that gold can be made from that which is not gold by the art, giving many reasons, and shows us six ways of doing it, if I remember rightly. Later writers also judged that gold could be made, but for other reasons, as we shall show a little later. Many of the Peripatetics also seem to be of the opinion that gold can be made by art, though they claim that it is difficult and dangerous. Timon, in the final question in the third book of Aristotle's "Meteorics" is one of these.

The subjects of form and species also cause some to doubt, for they have different meanings for different philosophers; and when it comes to changing form and species they usually speak with three voices. There are those who say that a species only changes into one other particular one, and there are others who call its content individual in appearance, for there are certain things that customarily spring from the first principles of the species both in the same way as and differently from certain living things whose birth is not from male and female, but otherwise, but this birth can neither be seen, nor

discerned by any of the senses; therefore philosophers often consider that those things that are born from coitus, and arise from the corruption of matter do not differ in species, or very little. Some will not allow first principles to be remote, but cannot deny them if they are immediate. I remember reading such things in Galen - whether it was this man of Pergamon (Galen) or someone else of the same name who commented on Hippocrates - for a chick is brought out of the egg not only by incubation by the hen, but the heat of a woman's breast, and by the warmth of horse-dung.

There are those who claim that the question is of an operation that is both wholly artificial and partly artificial and partly natural, and they reconcile the descrepancy by distinguishing a species as that which can be changed as far as its form goes, while its matter remains the same, which is done not so much with the aid of art as by nature, but nature acting not alone, but with art as a servant. There are those who say that the words mean that both matter and its form change, so that something wholly different is made, which is less absurd and may be said and defended, tho' wise men will certainly not admit that either nature or art can do it, seeing that is a property of the divine alone; consequently when gold is made from silver or whatever metal you like, they say that an individual is made, or, if they prefer to talk of species, they will have it that the material remains the same while the form changes, because the matter that was previously present in the form of silver is then found under the form of gold.

Thus one may say that part only of the species is changed, if a species consists of both form and matter, as we learn from the Peripatetic school, and St. Thomas in particular, and the more reliable of the moderns, although there are philosophers who say species, when they only mean form. One can also say that something does not change absolutely, seeing that part of it disappears, and part of it is joined when change occurs, for when the matter is taken up the form is broken, as we usually see with food that has been eaten; its form disappears and its matter is altered by digestion.

For the rest, I remember reading somewhere among the jurists that species should be defined in another manner, since they write that the species is not changed if, for example, gold is made from tin or

lead. Here they seem to be taking the genus for the species, unless perhaps one takes the metals such as bronze, lead, tin and silver to be less than the perfect species of gold to whose especial grade the rest of the metals may ascend. He who wishes to defend this notion will find nothing to restrain him either in the etymology of the Greek word "metal", or in correct logic; it is a long way from being rejected by the philosophical schools. Callisthenes' opinion, from which we differed above, is also held. If we accept it we must reject those who ascribe the various types of metal to the planets, among whom are John Versor and those who follow him in explaining Aristotle, who in one place expressed the foolish notion that iron does not melt, which a thousand eyes have seen and two thousand hands disproved. However, his planetary doctrines are negated by experiment, since, as we have said before, gold and silver give rise at one and the same time to one and the same medicine, whether in a single grain or in several, and nothing that the astrologers can dream up by way of the conjunction of the Sun and Jupiter can explain this, nor can any of their different daily maps of the planets. But since the vanity of astrologers has been refuted once by my uncle John Pico and many times by me, I shall say no more against them.

He who wishes to respect Callisthenes' opinions can easily answer Albertus, who held the opposite, especially as it is recorded in Josephus that "glass can be turned into metal", and that sort of glassy sand is said to be found abundantly near Ptolemais. Galen in his work on the power of simple medicines does not deny that glassy and golden sands are found together and give rise to metals there, or nearby; it is plainly seen that it is either the same metal, or can easily be turned into another. Since this whole question depends on distinguishing forms from species, we must first decide what distinctions to make between forms and species. No one who is even moderately learned can be unaware what a difficult task this is, proper to the heights of philosophy. I remember that I wrote a longish work mulling over this matter, the most difficult of all, in an examination of the vanity of heathen doctrine and the truth of Christian teachings, as well as in the hypotheses I made concerning human perfection; if I were to repeat them here, I should stray farther from the path and enter the labyrinth of nature, as it were. For

indeed, the Meander of the poets has as many windings as the thousands of controversies that arise therefrom, which will never be settled by human reason. So one must separate out and reduce to common sense the things that show whether gold can be made artificially or not and he who wishes to know must take the advice of the philosophical schools. I myself, with those mental faculties that I have, will first try to clarify what many think tangled and difficult, then I shall describe the experiments devised for the purpose, in their framework and salient features, not merely their appearances, and bring them to light, and shall do it with the briefest of propositions. So far I have told what various people have written in various ways about the power of the art, and the transmutation of species

Chapter 6.
Thomas Aquinas' opinions on the making of gold made clear.

But now let us make clear in passing St Thomas' opinions, which his interpreters are divided upon, for in his second commentary on the opinions of the Fathers he seemed to deny the art, while in his Summa Theologica he approves it. Therefore he is thought to contradict himself by those who have tried to reconcile the differences, but most of them have not done enough. Let the reader judge whether or not I have done enough. I therefore do not agree with John Lygur's premise, who excluded gold from the reach of the art because it was so noble; and he therefore mocked at the artificial making of gold. Now as we have said, Thomas allowed that a sentient being was a more perfect form. Among these the Mages, those workers upon nature, were the most outstanding in their results.

Nor am I moved because they could not find workers who could work properly or were properly skilled. For they knew the necessity for heat, for moisture and many vapours, which nature is accustomed to use for transmuting metals. Add that Thomas appears to deny it in his youth, but much later he steadily affirmed it in his Summa Theologica, the final repository of his opinions. Nor am I influenced by what influenced Lygur Sylvester and Peter Gomas, who thought that St Thomas wrote about poor workers in his second commentary, allowing

power to the one and denying it to the other. Now he speaks of the power of making, not of the makers, because this art is the minister and instrument of nature, which can be brought to perfection by all who are able to use it, whether they be men or bodiless spirits, whether naturally or supernaturally taught.

There is a certain type of person who cannot stand alchemy, or makes little of it, saying that it vyes with nature with its powers, but sometimes aids and overcomes it. The philosophers often accuse nature of sin on account of the recalcitrance of its liable material, but they nevertheless say that nature is ruled by intelligence and a separate mind; they admit that art commits many more errors, not only because of the unruly materials with which it is engaged, but because the rules for doing things laid down by right reasoning are slighted, whereas if a man were to use these rules, not abuse them, far from erring he would correct the errors of nature, if any. Therefore nature supplies art with its materials, while art leans upon nature, and so that they help each other, and are in some way subservient to each other in turn, so that at last the skill of the art with nature's help can make something that nature could not have made by itself, and even transmute earthly material, of which we may take that very gold about which we are arguing as an example. What prevents men from impressing that form on other metals by the aid of fire and the sun? Nature, employing the heat of the sun, places this form in the hidden places of the earth, for whether gold is made from sulfur and argent vive as Democritus and others say, and as I have often experienced, or whether it can be made from other vapours, purer, but none the less drawn out those same materials none the less, and compressed into a single nature, or whether it arises from some unknown liquid, as Theophrastus implied, or, if you like, from that liquid called lixivium, which Democritus is said to have believed, a lixivium mixed with calx, not, I say, that calx against which Albertus inveighs, for it was another one that Democritus mentioned, for Lixa was anciently taken to be a liquid, so therefore it was called Lixa by experts, and Lixa caro by the common people, or whether Democritus meant some mysterious thing by the word argent viva, or the metal in liquid form that can be said to be the first material of metals (the Peripatetics agree with this, and their chief spoke of

"ydatosgaresi",) or whether gold is made from some other kinds of thing that nature has hidden in the deepest recesses of the earth, why should not men do the same,using the same means? Can they not imitate the heat of the sun with the indulgence of nature? I imagine that this is the very least that is necessary.

Nor should one listen to the philosophers who think and teach that gold is created solely by the heat of the sun, as if the heat of the sun were not the universal cause of those things that are generated in the fabric of the world and then fail; this heat pours forth its gifts as much in caves and subterranean chasms as upon the surface of the earth. The fire is not only in the hidden veins of the earth, where the vapor of sulfur arises, the parent and nurse of gold, and it is revealed not only by Sicilian Etna and the neighboring islands, but in many of the mountains of Europe, and is conspicuous in the Apennines. Others who believe deeply in the art impress their own forms on the common material of metals, having first destroyed the original forms, and this they do not only with devouring waters, or by the power of various kinds of salts, or by means of oils of various sorts, but also by the use of gold itself when by the skill of the art it has been made fit to give birth to itself, the known beginnings of gold being mixed in with it itself, and in this manner they seek to transmute gold and stones and attempt to join powders together, and with the aid of these things they make much gold with a little thing that was given the name of Elixir by the Arab philosophers, which the Romans called Medicine, following the Greeks, by whom..... it is agreed that Psellus often used this name.

Chapter 7.

Artificial gold may be more perfect than native gold.

They learned certain methods of digging the substance out of the bosom of nature; the substance itself they were able to discern and get to know by referring to the clever Galicians and the other diggers for silver and gold, (and also by the way to other workers who, as I think, had been privileged to make metals from ancient times), who collected it from those rivers called Hermus, Tagus and Pactolus in

particular, and they learned to search the depths of other rivers, and to mark the shores of the Atlantic Ocean, where they collected grains of gold from among the varicolored pebbles; they labored, many say, not only with their own exertions, but also with unexpected luck.

As wise men have indeed asserted, most mortals perform the transmutation of metals by a divine providence, often hidden, but always right and proper. For I have read that silver was made while a medicine for horses, that contained argent viva among many other things, was looked for. I myself have seen both silver and gold made when neither was hoped for. I have even read that the art of making gold was anciently passed on by immaterial spirits, and though I have not read of this occuring in my time, I have heard of it, and shall say more when I am speaking of experiments. It sometimes occured during traffic with evil daemons, as I suspect, and I believe what has been written, that medical remedies were once revealed by daemons in various temples; this I remember enlarging upon when I was refuting the superstition of foreknowledge, especially in the books I wrote upon prophecy, and in my commentaries on my Hymns; there are many precepts of medicine now in use that antiquity maintained were taught by such superstitions, if literature informs posterity rightly.

Because Hippocrates is said to have passed on the teachings of medicine from books to memory in the quiet of Aesculapius' temple, now burned, even spirits can utter truth, though it is far from their minds; men may utilise true results, after they have striven to find out that they are really true, not because they are revealed by demons, but because such a result is a useful thing, and of a true nature, and can plainly be referred to God the primary author of all truth and all goodness; because God can find good even in the evil deeds of men and demons, so great is his ineffable kindness, to whom we finally owe our existence our perceptions and our life, as Paul the Apostle has taught us.

The utterances of reason persuade me that I should nowhere attribute the revelation of the power of making gold at any time to wicked men, or those who are steeped in inequity besides, divine justice does not allow those men to spread the poison in their souls to the disadvantage of humankind. This opinion seems to be strengthened when

we consider him whose name was Strix, of whom we spoke in our third dialogue, for he did not share even a few gold coins with his followers in obscene pursuits. We may therefore accept that something of the singular truth of the art is revealed by good spirits, though it is easier to attribute such revelation to teaching and experience.

Having collected many different things in various experiments, those skilled in the art were able to learn much, for indeed nature does not produce gold in one place only, nor by one method only. Albertus wrote that pure gold was to be found in river sands, and he had heard that impure gold arose mixed with rock, like veins, and presently he added that the gold found in the sands was better, for which he advanced two reasons. One was the greater purity of the sulfur strewn among the sands, better cleansed of its earthiness, and because its mercury is frequently washed by the river and rendered purer and more subtle. The other reason he says is that the heat hidden in the banks and the bottom turns back on itself when its passage is stopped up, and cooks the scattered substance of the gold into a nobler form; this is what he says in speaking of the places where metals are born.

Indeed I have said that the gold that I collected from the bed of a river has remained extremely bright and quite free of pieces of ordinary matter. Though I have been talking of pure gold, when trial is made, much of it is found to be mixed with silver. Albertus when speaking of the nature of gold says that a lump was found that weighed many pounds. A hundred marks are the words he used, but that barbaric name signifies eight ounces, so that those who weighed the lump found it to be eight hundred ounces. He says too, that in Germany in his time mountain gold was found that was consumed less than others when assayed, but in spite of this it was sold more cheaply because of its novelty; because this is a subtle point, Pliny omits it, but nevertheless he mentions many collections of gold from river branches, as from the Tagus in Spain, the Pactolus in Asia Minor, the Po in Ital the Hebrus in Thrace, and the Ganges in India and he tells us there is no gold purer than that rubbed and polished by that means.

Nor was he silent on the graves of wells nor the ruins of mountains, nor did he omit Canalitius, or Canaliensis, nor the fact that gold is found running like veins through pieces of marble gravel.

And so the artificers were able to learn from those who search for gold in mountain caverns, on the banks of rivers and on the shores of the sea, and likewise from those to whom it was revealed in another way, and learned to investigate nature, and imitate its nutering heat, first with a barely kindled fire, then with a slow one and then with strong heat, and in this way they tested the powers of the art in conjunction with nature, and finally, with many experiments, they drew the foetus of real gold from the amniotic membrane, as it were, and acted as its midwife, and by constant persuit, of the art obtained it, not only in a form that imitates nature, as they say, but in one that clearly perfects it; this seems to be in accordance with what many have asserted, and what I do not deny having seen, that is, artificial gold, made with nature's help may be more perfect than native gold, or of a better color, as the authority of Albertus tells us, and as many have said from the time of Psellus, who taught that gold made by art was better finished than the scraps, morsels and bits obtained from the Pactolus - if I may use his words "chrysoeidiso ton to Paktolo psegmaton" : besides, if there are distinctions between the gold found in the deepest corners of the earth, so that some is more valuable than the rest, as Pliny said, and Albertus, and Diodorus as we said earlier, and as Holy Writ formerly asserted, from the testimony of which we know that the gold of India was considered more excellent than the rest; if, I say, there are distinctions in nature's work, why should they be denied to the works of the art? Not only does nature outdo a somewhat imperfect art in power and wealth, but nature sometimes outrivals itself, as we said before, and as we have found in colors, scents, and many other matters.

Truly, it is written in the holy Book of Genesis that in the land of Havilah - but in the Septuagint it reads Evilat - which the ancients took to be India, gold arose, and that the gold of that land was the best, if we rely on the Latin translation "kalon", as the Septuagint interprets the Hebrew text, and whether you prefer to read it as "good" or "beautiful", one must allow that there is a comparison unless one prefers to say that the gold that arose in other provinces was neither good nor beautiful. Why was the gold found there said to be the best gold and good gold unless the gold found elsewhere was not good gold, or not as good as that of Evilat? One cannot doubt

that a thing is said to be best by comparison, nor can one deny that it is said to be good by comparison when one refers a substance of some kind to another which is not of the same goodness, therefore we must draw the inference that there are distinctions between natural gold, distinctions, I say, whether in kind or in quality, for differences cannot be denied, whether arising from the art itself, or from art in comparison with art, or in comparison with nature, or in nature compared with nature. We have the testimony of Pliny who called the gold made by Caius Caesar from orpiment excellent, (the author expanded on this matter elsewhere in his writings) that there is a variable weight of silver in all gold, sometimes a tenth part, sometimes a ninth, sometimes an eighth, or a fifth, and this portion constitutes electrum, the enemy of poison. Many distinct kinds of gold are produced by such means.

Gold, sometimes purer, sometimes less pure, is found in other metals. What? It is found in non-metallic substances, witness Albertus Magnus, saying that it would be found in about a hundred hairs of the human Cranes, and gold has also been found in my time in partridges' crops, and whether when they were pecking at the ground they swallowed it like corn, or whether by some hidden power it was generated from what they ate, they picked up from the ground the preludes to gold, especially from the noble powers of the grass in the Masus mountains, because as a youth doing military service in these parts, not far from Lake Fucino in the Alban Fields, I remember seeing with surprise how the partridges resorted there. I was then ignorant of the cause, and having not sufficiently investigated the matter to this day I am perhaps ignorant, although I suspect that it is connected with gold; nothing forbids this, for it is hidden in the caverns of the earth, and can be found on the surface also, nor, I may say, is there any power in the roots and grasses to suppress the ability to make gold, unless it is pure wantoness, and the same seems to be the case for four-footed animals, for reliable witnesses have said they saw ibexes in the mountains of Crete who fed on the grasses of Mount Ida, famed in song, and their teeth were golden-coloured, especially near the gums.

I pass over the kind of gold called obrizon in Greek, although Isidore and the Latin school liked to think it meant "that which

glistens with splendour". Pliny seems to be near the truth when he wrote of gold called obrizon, which was red as fire in colour, but those who are familiar with Greek literature, among whom in our own time is Hermolaus, think the word is formed from "abron", that is, tender, soft, or delicate, or, as I think, perhaps from "eurizon" (good root), because it is produced from the best seed, and grows as it were from the legitimate root, whether you consider it prepared naturally, or by art outdoing nature.

The Hebrews have a word for obrizon, for the Septuagint translates it, meaning sometimes the name of a place, sometimes a word that may be rendered as "purest" in Latin, and because they desired to use a word meaning "very pure", perhaps it is the same as what was anciently called apyron, see Diodorus, dug up by the rabbis of Arabia, unmelted by heat, and so brilliant in colour that the gold was brighter than the precious stones set in it; by the way it is mentioned in the Psalms and called the "gold of Arabia".

Beyond the other pointers to the excellence of the metal, is the fact that the mind may rise from contemplation of it to the peaks of wisdom, which is indicated under its mystic name by the word "gold". And so nature brings gold forth by various means, art likewise, sometimes as nature's servant, sometimes vying with it, or conquering by its help, brings it forth, for those who consider that the power of the art is not equal to this task are mistaken; they think that the art is an almost natural faculty, which they do not deem worthy of the name of nature, which nevertheless has power over primitive forms, for it is a nature endowed with a kind of cognition, having the character of a soul strong and intelligent in reasoning, and, thanks to this gift, it rules and arranges nature dumb and void of intrinsic reason, and, both ruling and modulating, sometimes imitates nature, sometimes vies with it, and sometimes outdoes it.

To the honors due to nature add that it simulates art, as when nature makes patterns in marble, as is found in the case of Polycrates jewel, and many other things, when, as the wise Poet says, nature draw its own bow in imitation of art, in that verse that ends, A deathly void is made by the withdrawal of art, nature can never simulate the characteristics of art. For it draws its own bow in natural pumice and light tufa. Of the power of art, more later; here let it be

stated that the more they who aspire in vain to use art for making gold are curbed, the more they unreasonably argue for it, but let it be stated, on the contrary, that it is easily able to be a help to nature and to overcome mute nature by hard work.

Chapter 8.

Five methods of making gold artificially, by which as in many other things, art outdoes nature berift of art.

The art of preparation excels in Chrysopoeia, and outstrips nature alone berift of the help of art, by the help of nature itself. Not only in glory, but in speed of preparation, as will be made clear when we speak of experiment. It excels also in being able to use many methods, for gold may be made artificially in five different ways.

First, the metal may be extracted from another metal, as when silver is extracted from bronze, something I remember seeing done. For metals are often hidden in others, especially silver in gold. Contrariwise, gold may be found hidden in silver, and even in lead and bronze something of the perfect metal may be found.

Next, gold may be made from those metallic substances known commonly as minerals (here I follow the barbarian appellation), for the principles of gold are in these metallic substances, especially in mercury and the sulfur that is not affected by fire, which, I may say, I have seen myself.

Third, gold may be made from the seed of gold; seed is what I call the ability to multiply, for in every natural thing there is a certain ability to propagate itself.

Fourth, gold may be made from that which is more perfect than gold, nevertheless such a substance should not be without the seed of gold, nor without those other principles that tend to generate it. The philosophers were extremely clever, painstaking, and careful about determining what the artificers can do, for they separate those parts of a substance that they choose for making gold into many parts, of which a certain proportion correspond to the elements, and a certain proportion to heaven, whether that heaven is like a quintessence, as

the Peripatetics say, or the essence of fire, as the Platonists say: and they unite the seeds of mercury and gold both with the elements and with universal causes, as the sublumary world is united with heaven, and they also make increase from the particular seeds of particular things, and thus they employ both the intrinsic natures of metals, and the seeds of metallic substances for making gold and silver very fertile. Moreover, this method is a general one, while the three I have previously described are special ones.

When the form of the original ignoble metal is torn apart, and the second more powerful form impressed on the metallic material, this is the fifth method. The first method is profitable, the second scarcely profitable at all, the third moderately so, the fifth greatly, and the fourth most of all.

Nor should anyone be surprised at what we have already said, that art excels nature to nature's benefit, for we have seen art that outdoes nature used for the good of nature in those matters that have to do with the making of gold, because it is known that God has placed in the oil, the water, and the salts made by art powers that are not given to the oil, the water, and the salt made by nature. Therefore they who consider that it is impossible to aspire to an art that can proceed beyond nature is mistaken, because the natural flow of its native ability must be considered higher and better if the exertions of art add to it.

For we do not consider the powers added to nature by the powers of art to be separate and different, but we say that art as the channel of nature should be compared in its functions with, as one might say, nature naked and powerless, and by comparison art is seen to excel.

How wonderful it is, moreover, that art is not wrongly represented as a special law of nature, as we have said already, but is deemed worthy of the name of nature; I do not mean a silent nature, but a nature properly arranged, intelligent and proficient. This we see in houses, clothes, and all the departments of life which were once rough and uncivilised, until the skill of the human mind, that is,of nature improved, a most noble and living instrument, as it were, came to its aid, and by its diligence those men who for centuries had lived in caverns and grottoes in the mountains, or in hovels that they had excavated, in the space of a few weeks came to live not only in huts

but in palaces, and they who covered themselves in the uncured wollen hides of animals were clothed in garments made by art, and they who nourished themselves on raw vegetables, the milk of wild animals and uncooked meat came to eat foods prepared by the benefit of art for the sake of health and a not unworthy pleasure.

Finally, if you make a universal survey, you will find that the improvements of art, that is, of the wisdom of human nature, outdo dumb nature that underlies it. Having done this, it is no surprise to find that what has taken the one hundreds of years to complete, the other does in a few days, or even in a few hours, by its operations. Thus medicine, painting, and military matters grew and waxed strong, thus men obtained philosophy, and became most familiar with theology, since men's survey of nature, relying on inborn wit and strengthened by experiment, investigated the powers and properties of matters within the orbit of the moon, herbs, fruits, rocks, and living beings, the contemplation of which led human kind to wonder, and drew it on to consider the secret of divine providence; in the centuries following they did many things by art that are scarcely believed because of their antiquity by those who do not believe what their eyes have not seen.

Antiquity formerly wondered at the petrifying power of certain springs, for they saw grass and turves acquiring a stony nature by continued immersion in flowing streams of water for a long time. Not only did I wonder at this when I read of it, but I even saw it within the confines of Italy when I was travelling from the banks of Lake Lary through the Telina valley to the Rhetic Alps; but my wonder ceased when I saw that not only did bunches of fern and frounds of elm turn into tufa after a year's immersion, but iron, silver, and gold become liquid in the twinkling of an eye.

Consider also that those marvellous specially endowed waters, made in recent centuries, that devour, some iron, some bronze, some silver some gold. I do not mention that common and well-known one that separates silver from gold, nor those that nature produces, which the Poet speaks of in his fifth book and the collector of natural history in his twenty-first volume; I would say that the following is not wonderful, except that the reader would consider that a sign of weakness, rather than a paradox - I have seen, as I believe, a water

that could be drunk without harm that had a power over sublimed mercury that the strongest and most devouring waters did not have; upon salt that well or river water dissolved it had no power at all. These gifts of the Chemists' art are the effects of natural strength, indeed there is something remarkably theological about the art, and dumb nature has long been said to lie dreaming in its power, meaning that a wonderful rebirth can quickly occur in natural things without any new miracle of divine power, and when it does there is no doubt that this rebirth is accomplished in the twinkling of an eye by fixed natural characteristics which give us intimations of eternity.

And another thing is that crude substances are overcome by finer ones, and these by even more subtle spirits, so that there is greater strength in the finest and thinnest spirits than in the whole bulk of the substance; there are many examples of this to hand. If one were to place ten thousand pounds of the substance alum or its salt that exudes from baked bricks on a light sheet of silver, to dissolve it in water, it will never dissolve, though it were pressed down for ten years with so great a weight. If one places an ounce of fine vapours, drawn from the very same materials, and the same of silver, that which was solid in form becomes moisture and liquid; this is not a work of nature, but of art outdoing nature, not in a variable and inconstant manner, but in a firm and steady way, so that the ignorant cannot speak of a variety of effects, like those learned and skilled writers of yore, Pliny, Seneca, and Vitruvius, who, when they were writing of the waters of Styx, a natural substance, not an artificial one, said, one that it was corrosive, one that it solidified, one that it was explosive; these functions are clearly contrary, having no connection with each other, rather there is an oil by which metals are deeply penetrated, weakened, liquified, moistened, and coloured, both inwardly and outwardly.

Nor shall I omit that multipurpose compound salt that excels the marine, mountain, or sandy salt known to antiquity; this artificial salt overleaps, if I may say so (NB), the others; moreover, it is made from substances that are seen never to burn as well as from those that are very hot and liable to ignite, so much so that I shall not deny having seen a salt made from sulfur that spurned fire

and was so brilliantly bright and shining that the salt which Greek writers, reporting the deeds of Alexander of Macedon,tell of, that was the acustomed gift in Egypt to the priests of the oracle of Ammon, could not be compared to it. And it is only a few days ago, as I remember, that at my command a salt, as lovely to see as sweet to taste, was made from the grass that grows in particular in my pastures in the Duchy of Ferrara and the neighbouring Duchy of Mantua.

For when my out-pasture shepherds were paying me my taxes upon it, seeing that it had been of help to their sick flocks, I thought that the salt, which resembled the grass in flavour, was the cause of its health-giving properties, and thus, while Po was within his banks, and not flooding the surrounding fields, it deigned to show us its riches; it was sweeter and more beautiful than sea or mountain salt, and in matters metallic, unless I am mistaken, more useful; I make no mention of its penetrating, drying, and burning qualities which were discovered in a brief moment by art, and under its attack the former shape of a metal is broken up, and then some other form can easily be born and grafted on by the help of art and nature's bounty. Someone may say that nature, though silent, is ruled by an unerring intelligence, but on the other hand it still cannot receive any further help from its constituent parts, while the human mind, helped by art and strengthened by practice, brings it aid; much is seen, not to mention read, about the plentiful production of metals in a few days by human art, although nature will not generate them, except after the passage of many years.

Now Michael Psellus, writing a few pages upon the art when he was weighing it in the balance of philosophy, wondered at reading in Strabo about the aforesaid transmuting power of some fountain, whilst not reading about the changing of metals into the shapes of other metals by artificial aid, though he remembered many such. Unless, as he says of the matter elsewhere, it is compelled by some proper power, which is what he concludes.

Chapter 9.

It is unnecessary for those skilled in the art of making gold to have a deep and profound knowledge of the finer points of Philosophy.

Nor should we listen to those who say that we should know the primary elements and the proportions of the substances resulting from them to make gold; for there are those who say that we can know nothing of what nature holds in store unless we have already investigated its beginnings; but neither reason nor experience can reach so far, only guesses that are uncertain and in all ways doubtful.

But the craftsman skilled in the making of gold need not take the time to investigate obscure causes; it is enough if his character is that of a minister to nature ever-bearing and producing what it has been divinely ordered to do. So a midwife does not enquire after the nature of the foetus, of which she is completely ignorant, but assists the woman bearing the child; so the farmer, refusing knowledge of the inmost properties of wheat and barley, commits the seeds of those crops to the earth, where he harrows and tends them, and does not vainly expect the rewards of his labours, that is, the numerous offspring of a sturdy stock; and it is the same when he makes a graft; its nature is not that of the tree on which he makes it, nor of the glue he uses, nor of the way bark softens and becomes closely joined to bark; rather, when he has driven wedges and inserted buds he sees a progeny growing that promises flowers and fruits.

What? See how a man, who, as Aristotle wrote, can produce another man by himself, gets offspring by way of a woman, but not every time; but although from a hundred or a thousand meetings scarcely one is not in vain, but productive, still his progeny is numerous; nevertheless he is ignorant of the nature of his seed, nor is it known either to philosophy, or to the doctors who quarrel among themselves as to whether it comes from excess food, or the brain, or the whole body, or from somewhere else. Does it come from the male alone? Or does some seed flow from the woman? Though these things may be uncertain and unknown to him, if he will not be disappointed of offspring if his seed is fertile, if it is received by a fertile woman in the

right places, and if all the other functions, both of male activity and female passivity, necessary for the same result run smoothly; then the infant is conceived according to the order of nature and is born in due time.

One should not imagine that things are otherwise in the art of making gold, where the most marvellous equipment of all is used, nor should it be necessary for the artificers to know every genus and species of those metallic substances commonly known as minerals; for their parent herself scarcely knows what is born and hidden in the caves of the earth, so various are they, so great and unknowable their number; but it is enough to be thoroughly acquainted with kindred substances, known by experiment, and to know the rules of change thoroughly. Nevertheless, we do not deny that there should be wiser workers who have explored the nature of efficient causes, so that they obtain a good knowledge of how to impose the proper form of gold on to the common base of the elements, and even if this common material is occupied by the form of a less noble metal they can aid it, and it will learn to be cured, so that they can drive away the previous form, and upset it from the place it has seized, and while driving it away they obtain a good knowledge of the way to try and put the more noble form in its place, like some of our predecessors, who knew whatever seeds of multiplication lie hidden in metals, as Aristotle plainly wrote in his second book De animalium generatione, when he showed what was the reason that seed proliferated, and says that what is agreeable to it in the realm of nature is not fire nor anything so strong, but the warmth that is contained in the seed and in that foamy matter expressed in the word Spirit, in which there is a quality corresponding in part to the elements of the stars. Aristotle was pleased to write these Greek words, that have been translated into Latin in various ways, "panton men gar.....toikeio."

Wise artificers therefore seek with all care and diligence to obtain this substance that is drawn from metals. Many of the Peripatetics gave it the name of Quintessence, as they believed it was a general cause. In a similar manner heaven is a general cause. They also strove to turn earthy material into a powder like burnt calx, and prepared from it various kinds of salt and oil of great power, and strove to turn more liquid material into water, and finer

material into the thinnest airs and vapours, equal to fire in strength But, as we have said, it is not necessary for all workers to know this, therefore we give you the secrets of our riddles in verse, and if any of them are clear to you, proceed accordingly.

"He who really knows the hidden seeds and causes of the world, let him be chief and best of artificers; yet it is not necessary to know all and everything for you first to flit your way on mighty wings through the peaks and heights of heaven, soon to descend to your mother's great womb and crawl, seeing the nuptial couch, the child, and the progeny of sulfur and argent vive in blinding mist. Believe me, it is enough to hold tight to powers close at hand; then shalt thou make one of the twin birth."

And we shall see what follows. But as far as concerns the theme of the present argument, it is enough for artificers to know what we have said, enough for them to hold fast to certain secrets and weights commonly unknown, to know the various vessels in which it is prepared and of which they are the masters, taught by experience and the help of nature, of which Albertus spoke when he was writing of the places where metals are generated, although later workers have discovered much, and have made preparation in one vessel, with nature's guidance and much experimental labour, and they have come to know the heats and strengths and of the flames, and the right times to apply or remove the fire. Receptacles of glass or earthenware are suitable for the work of preparation, in which new material that formerly lay hidden in the earth is treated.

Chapter 10.

Gold can be made more easily in our century than in previous ones, and I have assembled many arguments against those who slander the art and against even famous writers who have a dissenting opinion concerning cinnabar, mercury and many other things.

Gold can be made more easily from these substances in our century than in times gone by, for they did things more simply, and we now seldom use those things which they made great use of long ago; all

the same, they employed certain minerals of which our artificers do not really know the name, for example, there is the word "ochre", for although some people think they know what it is, they are greatly mistaken.

I am certain (unless I am wrong) that I have discovered at least three things to which this name may apply. Who knew pyrites, unless, as some think, it is what is commonly called marcasite? I do not think sandarac was known, unless it was that substance that was brough to me from Venice under the name of red sulfur. As I say, who will not tell you that cinnabar was created by Bucasis the Arab from mercury and sulfur, as far from true cinnabar as a lion from a monkey? It is different in color, unlike in nature, as will be made plain in due course. Who can show that chrysocolla praised by the ancient artificers and masters of making gold? I am speaking of native chrysolla not the one mentioned, or rather, hinted at, by Pliny, nor the one Galen mentioned.

For anyone could have made it (cinnabar). But nonetheless we have many substances that are not only brought from afar, but found in Ital itself. For many minerals are dug up from the caverns of the earth that were unknown to the ancients. I think they may be produced in mere days, almost, and testimony that we cannot reject says there are different mixtures of minerals that have different colors and tastes, therefore different effects proceed from them, their superficial qualities varying according to their nature, and the more abundant they are, the more cheaply they are sold; nor am I alone in asserting this, for formerly by decree they avoided digging in the Roman's Italian mines.

Now although many things that are of great advantage in the matter are imported from different directions, and are supplied indiscriminately, nevertheless, as I have said, much is produced and brought in that the ancients did not know of, chalcacanth, for example; and, as they said, they pursued the business with few resources, nor do they make any mention of the white chalcacanth that gives a bluish color when rubbed, and there is a chalcacanth of an ashen pallor. And there is a sulfur, green, blue, or vari-colored in appearance, as diverse in power as in color, that is called "apyron", that is, untouched by fire, unless perhaps the ancients were further advanced.

Now you see an apyron that is rather shiny, like electrum, and white and ashy coloured, and green and yellow and black, and red, seeming to vye with red ochre in its flaming color. There are others besides that I shall not review here, because there are no Greek or Latin words for them. You will find others quoted by name in Aristotle neither casually, nor of set purpose, as "Sandarac and ochre and milton and thuon", and a little further on "cinnabar" is dragged into the story as a stone, not that cinnabar that they say Bucasis the Arab made out of mercury and sulfur, nor that which they assert arises from the struggle between an elephant and a snake, but that which is dug from holes in the ground and was imported from Africa; I know that twice in my lifetime I have seen it in Italy, and Diodorus and Vitruvius have written that it was imported in Augustus' day, the one when speaking of the medical faculty, the other talking of painting houses. These substances found in mines of metals and dug out of them are also called minerals, and among those that are dug up, according to Theophrastus, are chrysocolla, cyanos, ochre, minium and sandarac, although chrysocolla and cyanus are sandy, ochre and minium earthy, sandarac and arrenicon (for he calls by this name what others call arsenic) are dusty and he informs us that there is no difference between them. From this passage one may gather only that one cannot rely on certain, however famous, when they describe ochre and a lot of other things.

Theophrastus was the first to say that there was no difference between ochre and arsenic: Pliny says the same in another way, and he clearly made mistakes in other matters, for when Pliny thinks of cinnabar, chrysocolla, and sulfur, he thinks they are the same as minium and Greek milton, and calls them cinnabar. This is denied in other places, for in Theophrastus and Aristotle and Galen you will find that Milton and Cinnabar are different things; Galen elsewhere mentions Lemnian milton, an earth that repels poison, and says that he received twenty-thousand lumps of it, signed by the priest, when he landed on the island of Lemnos; but besides this you will find that milton and cinnabar are different in all the famous writers on natural history, some of whom call it cinnabar, not cinnabari: Theophrastus indicates that there are two kinds of it.

The one is naturally produced in Colchis and Spain, the other is artificially made, not from mercury and sulfur, but from the scarlet

sand that Callias the Athenian first made ninty years before, and from which he hoped to produce gold. From this you will understand that Pliny erred not once but many times. For he writes that Callias prepared minium, not cinnabar, quoting Theophrastus, who nevertheless distinguished between the two and had separate names for minium and cinnabar.

Pliny besides wrote that cinnabar was sandy, Theophrastus that it was stony, and in his own tongue (Greek) he calls "lithodes" what Aristotle described in these words, "to de lithos ek toiautes gigaus sisaseos oion kinnabari."

Pliny says that minium, which Dioscorides called "amenion" is found in Ephesus, but there is no word of this in Theophrastus, for he write that cinnabar is made in Ephesus, and adds "kai argasias." Likewise, cinnabar arises naturally in Colhis and Spain; I substitute the word "autophues" for it, thus this passage points out that artificial cinnabar was made in Ephesus, and the natural came from Spain and Colchis. He ascribes true minium, not that which is nowadays made from lead, and imitates the color of natural minium, but that which is sought in the deepest recesses of the earth, to various localities, although he says that there are two kinds, the one arising naturally, the other manufactured. These are his words, "esi di hoper milton men automatos he de technike". Theophrastus adds that cinnabar is very hard and stony, to which I can testify, having seen it with my own eyes.

He says that milton is minium and ochre a kind of natural earth; I am surprised that, if Hermolaus did edit the Corollaries of Dioscorides, he did not correct Pliny's errors, which he says he rejected when he edited a criticism of Pliny. Of the others, only Theophrastus mentions two kinds of cinnabar, but he does not mention the blood of the snake and the elephant, to which Pliny gives the name of cinnabar, and which Dioscorides previously shewed to be different from true cinnabar; this, I think, Bucasis and his imitators in ancient times did not make, for it displayed its color in part only and not all over. For artificial cinnabar is red on the outside only, native cinnabar is much brighter within, in which it is more like blood, whence there arose the idea of the struggle between the snake and the elephant, whether it had its origin in history or in fable.

Add that native cinnabar when heated in the fire becomes brighter

and cleaner, whereas the artificial becomes a cloud of which nothing remains. In the natural one you may see sparks of mercury shining, in the manufactured thicker lines, as it were, of mercury. Nor do I distinguish between argent vive and hydrargum like Pliny, who called the latter manufactured, the former natural, contradicting Dioscorides, who called by the same name that which is made from minium and that which nature bears in twofold form, hanging in the roofs of silver mines, where it forms drops, or itself in mines whence it is collected.

Thence we may understand (as it seems to me) the great mistake of Pliny with which others have taxed him, that is, he divided it into two genera, of which he considered that one ran from the rock as a liquid; he called it an eternally liquid ulcer, poisoning everything; the other he says arises in different ways. So then in Dioscorides and other reputable writers hydrargum is the same as argent vive, in Pliny they are not the same because the Greeks called it "silvery water" from its watery color and liquid fluidity, while the Romans called it "quick" because of its movement.

The selfsame Pliny does not seem to agree with himself about this, for he uses the name hydrargum only when he is speaking of gilding silver, nor does he say enough to distinguish it form argent vive which the artificers use only when they are making gilded vessels from pure silver ones. Even those (and who will deny it?) of whom Vitruvius speaks in his seventh book used to use it; moreover he writes that argent vive is made from fragments of stone, and that the artificers collect it when the fumes of the fire have subsided after the vapor has been made to rise, and who can doubt that they used it; they made it; they got it not only from minium and stones from every metal. Posterity is superior to antiquity in this, for now it is not difficult to get argent vive, or hydrargum, if you prefer to call it that, not only from any metal, but from many minerals, and it is amazing that Galen, who was as experienced in literature as in experiment, should think that hydragum is artificial, not native. For when he spoke of simple medicines, these were his words, "ek esi ton.....skeuazoment" not from those medicines that arise from nature, but from those that are manufactured. For the rest, we do not read of so many natural materials as are now used

by makers of gold and silver, either in Vincent, or in Albertus, who were the first writers of this kind after the Greeks and the Arabs to mention natural things.

If I have counted correctly, Albertus has written of eight kinds of naturally occurring minerals, salt, alum, atrament, arsenic, in which he includes orpiment, which certainly ought to be called by that name, for Vitruvius writes that orpiment, which is called arsenic in Greek, is mined in Pontus, and Dioscorides, a man of the same era, said that it was not good orpiment, but rather pale, while that native to Mysia near the Hellespont is of the true golden color and first quality; yet he used the same word for arsenic and orpiment, which even Celsus and Pliny after Vitruvius used, and there is a third kind that the Romans, the Arabs and Albertus spoke of, nor are there wanting those who said that it was not white, but medium-colored. (menium?).

Anyone who expects to understand the matter from Albertus will be disappointed, both in his words and his reliability. To these (preceding) he adds niter, marcasite and tutty, although he calls it artificial, not the work of nature.

True marcasite has not yet been discovered (they say) among our ancestors, unless it is that which Dioscorides and Galen called pyrites, though it is said that Democritus discovered it, and it is of a silvery, a golden, a bronze, and, I would add, of a tin and a leaden color, although it is the bronze-coloured one they recommend for medicinal purposes. Finally, Albertus lists electrum, which, whether it is among those metals that nature bears, or is artificial, cannot be counted among those that are dug from the deepest caverns.

But the things that miners nowadays dig up to prepare gold with can scarcely be added to their number in any short space of time, for besides white arsenic, which they called after crystal, and tutty, which although it was called by this name by some of the Greeks, was formerly called by this name by some of the Greeks, was formerly called Cadmia, there are many kinds of marcasite that perhaps are not remembered, and, as I have said, many kinds of calcanth not known to our ancestors, and many kinds of sulfur as well. Add to this many kinds of talc and many kinds of antimony never mentioned by the ancients, although there are some who equated it with stibium, without,

I think, clear authority or good reason. Add to this many kinds of alum of which antiquity transmitted no record, nor any evidence in the wonderful golden relics they made. I now record what I learned by experience a few days ago, a rust-coloured cinnabar that was shown me, of which there is no mention among the ancients, nor do I believe they used it; I tell you I neither found nor sought it, for who finds what he does not seek? Who seeks in nature for something he has never heard of? From such conjecture about cinnabar I have learned that if it is anything, it is a blackish mineral, heavy, of a blue color on the outside, which remains the same colour if rubbed; if it is burned it shows red. Furthermore, part of the sulfur that it contains goes off at first in a blue flame, then that which is wholly mercury disappears, and the remaining part of its sulfur is intransigent and contemtuous of fire, but if it is mixed with the liquid vapors of devouring waters, the opposite happens. For the sulfurous portion dissolves in the water with a great rush, so little does it resist the fiery liquid; however, the mercurial portion does resist it, and remains in the bottom of the vessel, hardly consumed. I have related a wonderful thing, not, I imagine, known to antiquity, which, even if it labored to make gold, as I have said, used few materials. Moreover, artificers in our time labor with many things besides calcination (I use the words of Albertus), distillation, sublimation, and other activities that are either not mentioned by ancient workers in the art of gold, or are not explained. The same author ascribes an elixir to them (Latin writers use the same word as the Arabs for a medicinal principle) by the use of which it is agreed that the primal species of minerals is penetrated, so that they can be broken up, so that only the material they have in common is left, not any particular one; and a different metallic species may then result by means of great art and great effort.

Albertus, talking of the artificer's vessels, tells us that any metal can be tinged to the color of gold, and (to use his own words) perhaps even a more beautiful color, if the elixir be noble and the artificer has made no mistakes in it. From this passage moreover, they who will say that there is one nature beneath all metals can easily defend the art, nor is support wanting for those who think there are several natures, not counting those that Albertus mentioned;

for one may dissent from his reasoned arguments by saying that he spoke, not of perfect natures, but of ones that were in some way unfinished, which he allowed was the case for the first matter of nature, fruitful and corruptible.

The matters he appears to discuss in this passage are both held to be rather subtle, and actually are so, and are collected here in such a way that the common folk, bound by their opinions, may learn that not only are there various ways of defending the art, but that the ancient artificers also used many; and they who labour without reason to dethrone the art of gold-making from the seat that it has held for ages, by legitimate title, hallowed by time, can be more easily checked; those whom I have mentioned can learn that is not one but several ways to make gold, and much more easily than in previous centuries; for they were able to make it from those substances we have mentioned, and skill in the art grew with long practice; from time to time the application of remarkable minds and their ingenuity lead to the same result; therefore those who slander the faculty of Chemistry should rightly cease from their insolent calumnies; although they are not among those who believe in the subtleties of nature, nor capable of the same propositions that the philosophers have so acutely investigated, nonetheless they cannot claim that any pursuit is lacking, according to its measure, in the excellence of the divine, which pours out its gifts and so the art is encouraged to produce the like.

Nor can they deny similar experiments, such as the passage of slight odes over great distances, the raising of huge masses of flour with a little ferment, the iron joining the absent magnet to itself, the live remora delaying vast ships, the infection of a little vapor whereby thousands of men are wasted by pestilence. Now if these things I have enumerated can, by their touch, and dare I say, by the mere look of their power and strength, change things, lead them out and back, which no one would believe unless his senses had told him, why then should they deny that metals can be changed when the senses say yes, and the reason does not say no? For I ask you whether any man in his zeal and industry ever discovered in detail how the great mass of a ship can be immobilised by a little fish, how a large heap of flour can rise with a little ferment, how with the

smallest amount of an odorous substance the whole house, and clothes too, smell strongly, why iron, pulled by no machine, hangs in the air in the presence of a magnet, why a fine and invisible vapour has the power to infect inhabited regions and bring ruin. For although there has been much argument about prime qualities, intermediate qualities, proper, high, low and unknown qualities, the philosophers' understanding concerning this kind of hidden matter is as follows - we may read almost as many opinions as there are writers.

Nothing else that could satisfy the mind has been discovered to the present day, save that a thing is its attributes, which are called the mutual friendship, enmity, or as the Greeks say, sympathy of things, which is in the end nothing but an abstruse and incomprehensible quality, nor can one say otherwise when from the juice of one or several plants comes a liquid fluid silver that then hardens, and when mercury likewise, vanishing away solely by the heat of the fire, is turned into silver or gold, or when, from the finest grains of salts or alums, or from various kinds of oils or waters, or from some substance not generally known, something is made (for the art has a wide and all-embracing scope in matters of this kind) that omits none of the elements, nor any of the substances made by joining the elements; so the art destroys, composes, joins, tears apart, and pulls up and down whatever it undertakes to work upon, so it varies, it renews, it perfects whatever it finds in subterranean caves or on the surface of the earth to make the substance that it promised itself it would make. The question among theological polemicists was whether this was creation, that is, can the Creator himself communicate to his creatures the power proper to God alone and assigned to the divine omnipotence? Opinions are recorded on either side, but as far as creation is concerned, there is no doubt that the remarkable ability by which a substance loses its earlier form and acquires a subsequent one is not communicated either to nature or art, for what nature is said to be able to do in a hundred years, art can do in an hour and a half, and often in the hundredth part of an hour.

A friend has more than once shown me how a mineral can be dismembered in less than the tenth part of an hour, so that its sulfur sought the height, its mercury the depths; I have seen the former appearance of a metal vanish completely, and a new golden one suddenl

impressed on it by art and craft; nature alone, that is, nature befeft of the aid of art, does not do so, nor did antiquity, as is plain from reading ancient books, but the work was of longer duration. Posterity clearly emulated nature and imitated it; meat and food are converted in single days to clear blood, whether by digestion, or by some other means; for received opinion is different from that of antiquity. Here I have touched only on one good method of altering minerals; I have mentioned others above, and since we have already written of them, it would not be fitting to repeat them at length.

J. Fr. Pico della Mirandola, Count of Concordia, UPON GOLD,

Book Three, Chapter 1.

Ancient experiments in making gold by the chemical Art.

In the first book we discussed the reputation of gold, showing that no persuasive reason can be found to explain why so much is made of gold that it is the measure of all things. In the second, having collected together the varied opinions of different kinds of authors, we went on to prove from the early philosophers and from the theologians that it could be made by art. In the third, which we have in hand, we shall convince you that gold has been made and can be made now, by dealing with experiments ancient and modern; we shall append sound advice on its use, lest you be liable to slip into shameful abuse. Certainly public opinion has most firmly stated and agreed that gold was formerly made by the art and craft of man, and let me recall that after ancient times Vincent of Beauvais placed masters of this art among the first of men, as we said in our introduction; this information came down to the Dominican and his contemporaries from the time of Moses. The Greeks said, as we have already indicated, that the Argonauts sailed to Colchis for no other reason than this, nor did Jason carry the golden fleece of Phrixus to Greece from the home of King Aectes, but a book made from the skin of a ram, from which one could learn how to make gold by chemical art. It was therefore not wrong for our ancestors to call Phrixus' hide a golden fleece because of its power to making gold.

This is easily seen in books both common and rare, for instance in Suidas, Elementum Posteritatis,and briefly and obscurely in the second book of Apollonius' "Argonauts", where he says that Phrixus' fleece was turned to gold by Mercury. In this passage the author writes that the ramskin was turned to gold by the touch of Mercury; by this he clearly meant the chemical art; his words are, "te ephaphe .... geneaz chruson." Now Charax says plainly in his Philosophy, rather than in his History, that the fleece for which the Argonauts sailed was not thought to be that of a live ram, but was a method

of making gold, "membrana peri eillemenon", as he calls it, an all-embracing parchment, as Eusthatius says in Dionysus the Libyan's Geography. What? Is there not a Greek proverb saying one can make precious things from skins? Under the veils of fable the ancient writers have hidden not only the fact that how to make gold was written on a sheepskin parchment kept in the house of King Aectes, but they also indicated the method under the name of Dragon and Mercury, for it is known to those who profess the art of Chemistry that argent vive is signified by the words Mercury and Dragon.

Therefore they said that gold was made by Mercury's touch, and made the watchful dragon the guardian of the golden fleece. We have also read in Orphic verses on the theft of the Golden Fleece that there was a meadow under the tree that bore the Phrixean skin in which many things that are believed to lead to the production of mercury were plainly seen. Not shrubs and pot-herbs alone, but chalcanth, that is, atrament, not calchanthum, or even psalachantum, to distinguish the vegetable name from the metallic one, so that the fabulous fleece meant not merely one passage, but a whole book that taught the art of gold-making; this is what the Golden Fleece signified in antiquity. Nor is it unlikely that written documents, called by the name of the golden fleece, or the fleece of the golden sheep or ram, were part of ancient Chrysopoeia. So for Ovid the poet, a name like Golden Tree came to mind, seeing that fruit is borne on trees, while the effects desired are produced from a written document, and this passage seems also to concern the gold he derived from the stolen parchment.

Nor were there lacking those who declared that the riches of Tantalus were descriptions of chemical compositions on lambskins; the reign of Pelops' sons and the Pelopidae was long and widespread, hence it seems likely that Thyestes the younger son of Pelops sought after a lamb, that is, a document on the making of gold written on a lambskin, that the elder son Atreus kept secretly, and Thyestes, having violated his brother's wife, extorted it, whence arose the hatreds and cruelties of the hoary tragedy. The old poets and Cicero, Seneca, and Papirus recalled this, although on a hidden and obscure manner. We also said above, on Callisthenes' authority, that the riches of the Pelopidae lay not in the hides of their

sheep, nor in taxes, but in minerals (far from offensive by their age??).

Nor shall we linger over the fact that the art was spread to other nations from Greece and Phrygia, that the Egyptians, much given to the study of wisdom, cherished it greatly, and among them at the time of Diocletian the art of gold-making was as well-known as that of cultivating the fields, and it is reliably reported to have been produced down to the time of constantine, for at that time the philosopher Michael Psellus composed an elegant little book in Greek on the making of gold.

Someone will perhaps ask why the art was not generally known to have existed. I reply (omitting much that could be said) why does not the art of dyeing garments that was so famous in former times, not only in Tyre and Sidon, but in the whole world, exist now? Nowwhere is it found to-day, nor do the artificers know the shellfish from whose blood the color was prepared. The materials for making gold are clearly in evidence, and the process known in many places, even if it has perished completely in Egypt. Besides, the method of making gold was known to the Romans, witness the thirty-third book of Pliny's Natural History, which told of one means of making gold from orpiment that was dug up in Syria for the painters as an earth very much the colour of gold.

Caius says that he ordered a great weight of it to be heated, and he clearly made good gold, but so little that he suffered a loss. Pliny says that it was known to be produced from orpiment alone and tells us that gold was made by art, to which perhaps he was an eyewitness, for he lived at the time of the earlier Caesars, and lived to see not only the rule of Caius, but that of Claudius who succeeded Caius and even Vespasian. He fought with Caesar Germanicus, whose deeds he committed to writing, also those of Claudius his son, who was Caesar's descendant by his brother Germanicus, and was chosen to be Emperor; he says he saw Messalina sitting beside him when he ordered public games. Pliny the Junior affirmed that he wrote under Nero and that his Natural History was dedicated to Vespasian, as the title shows.

But Caesar suffered a loss, perhaps because there was less than there should have been, and because of the great expense of sailing

and bringing orpiment to Rome, and perhaps he would have made a profit if he had a sufficient quantity, as much as Onescritus wrote was found in Carmania, or if he had had the knowledge of the Egyptians, who were so fearful of Diocletian, whom we mentioned above. The Greeks wrote that Diocletian Caesar ordered all books of Chemistry to be collected and burned when he was cruelly oppressing the Egyptians, for he feared that they would recover their wealth and dare to rebel by means of the art of gold-making in which they excelled. This can be seen in Suidas, in the tenth compilation of his Elements. After Diocletian gold was not made from orpiment but from golden sand, as was openly done by those who practised the art, as long as they paid the Caesars a few gold scruples, and for this reason the two early laws in the Codex Justinianus entitled of Metals were made. This sand was called Chrysamos by the Greeks, and balux by the Romans and Spanish, as appears clearly enough in the civil laws and in Pliny, so I need not mention the absurd words balaca and chrysamos in the glossaries of Accursius.

In our time a certain studious and learned man considers one should read not Chrysamo but Chrysamon, and interprets it as the vessel from which gold is poured. But Chrysale is the name of that vessel, even in Plautus, and the word is still commonly used with three letters inverted. It ought beyond doubt to read Chrysamon, that is, "golden sand", which was, however, not mined, but gathered from the seashore, and gold was prepared from certain mixtures of it.

The two laws previously mentioned deal with it, the others must be understood as dealing with mines, as is plain both from the wording and the different taxes mentioned by civil and canon law. For chemists owed a few scruples to Caesar's treasury, while miners paid a tithe. Psellus recorded the first of seven chemical means of making gold, telling us of a certain sand of the seashore, called golden from its color, and named "the golden sand" by some; these are his words, "ammos tis esi ... chrusammon onomazousin". Galen when talking of the power of simple medicines obtained from the earth also begins by making mention of Chrysitis and Argyritis, then he speaks of golden sand from whose appearance its richness could be judged, and hence you may understand the difference between balux and chrusammon, because Pliny says that the very smallest chips of gold are called baluca.

Even if chrysamos consists of the tinest grains, they are not gold, but only of a golden color, and gold will be prepared from them by many digestions of various mixtures. Elsewhere psellus reported that it was not paid in such grains to Caesar's treasuries, but that gold was extracted from it, and recorded five or six methods. Yet he swore that honesty compelled him to many things, whence his words, "ho despota ho emos..... psyches turannis".

There is also the testimony of Albertus concerning experiments attempting to make gold by the art, of which he read, and he agreed that it was commonly reported and known that one should believe those skilled in the art. What? He adduces not only the experiments of others, but his own also. For when speaking of argent vive, having said that it was the matter and substance of all metals, and has the power of burning and digesting sulfur and touches off the birth of gold and silver, like the menstrual flow of women, adds that when it comes to start a new species it first collects in little lumps, then slowly hardens and is converted.

Albertus did not see this in caves of the earth, nor in the hidden recesses of nature, nor did he dig with a troop of miners, but he saw at home, or in the light of day, for he would not have had leisure to observe under the impending fall of the mountains. Nor would he have been so foolish and forgetful as to remain in the lower world with no light and very little hope of returning, in order to witness the nuptials of Mercury and Sulfur, which perhaps are celebrated once every hundred years, so that he might know how they did it in their noisome bed. We also have the testimony of the noble Arnold, philosopher and doctor, and the record of his experiments among the legal documents and addenda of Gulielmus, nicknamed The Speculator, for he writes that Arnold, whom he praises greatly, sent twigs of the gold that he had made to Rome for all sorts of tests (this is in the document De crimine falsi), nor is it likely that he would have omitted that water which separates silver from gold and is an argument powerful beyond all others, if it had been used in his day; but certainly proof by fire was not wanting, whereby if it is heated seven times false gold disappears, as Albertus, who nevertheless lived before Arnold, tells us; but as I shall not mention Raymond the noble Balearic islander before I come down to

the men of our day, I shall refer to the testimony of Albert of Colonus, the Franciscan.

For when he was writing a volume on the quintessence of sublunary substances and how it can be extracted from almost any single substance, he added that he could show if only he wished with which one of the theoretical sciences he could teach the reader how in the twinkling of an eye to change imperfect metals into silver and gold; this he said he received in his mind when he was kept in an old prison, nor did he receive it from the mouths of those men whom he called men of the Evangelical communion, by which title he calls the order of the holy men under the rule of St. Francis, witnessing that they were not slipping into alchemical operations at the instigations of some evil demon, since no philosopher made the truth plain in his books, but hid it in incomprehensible parables; no one is allowed to reach those sublime secrets of the chemical art except by the highest contemplation and the purest life, by which the mind is joined to that of God, and this he claimed was given to very few.

Chapter 2.
Experiments in gold-making in our day, wherein lie many feats of Chemistry.

It has been established by both the eyes and ears of many living, and of myself, not in one manner only, but in several, that gold and silver have frequently been made in our time by the craft of converting metals. Nor have the books I have just read persuaded me, although you may tell Pope Leo that they seem to show that the art is genuine; so far are they from denying experiment that one author who wrote a book began like this:-

The golden art for men of little souls, sought by us and long ago obtained.

And another, writing about Chrysopoeia, ends thus:-

So old Jason took the golden fleece from happy Colchis.

For it is likely that what the Poet wrote was true, the more so

because the Poet (Virgil), according to custom, writes that he had said enough at the end of the previous volume when he made mention of the gates of horn and ivory. For many historians do not have before their eyes what I have seen written in a certain large volume, that is, three or four compositions of varying nature for making gold; let us make them known.

I shall refer first to what I have heard then to what to my eyes have seen. A few years ago Nicholas Mirandola died, an old Franciscan priest, known for his honest life, his freedom from sin, and his abstemious and solitary life in particular, who had lived and died among companions of great sancity and shared in those holy revelations some of which you will readily remember, wife, you sent me in Germany during the aforesaid war that Pope Julius waged against the Venetians. He made silver and gold by art in Bologna and Carpus, according to many witnesses, and he also made it in Jerusalem where he was for many years as ruler of the men of his order, where he himself told me he had made gold, to which there is still a witness living. Nicholas Mirandola, the surgeon his nephew, even told me that his paternal relative freely and openly confessed that he was skilled in the art of making gold and showed him a book written in his own hand on many subjects, where by reason, the testimony of the hearth, and two experiments, he brought the art of making gold to light, and he had then told him that he had hidden it in other places by interpolation and under oblique turns of phrase.

Living in our day there was besides Apollinaris, a priest of good reputation in the aforesaid order of priests, who did not hesitate to affirm to his friends that he knew more than twenty ways of making good gold. When they had finished with religious matters and turned their minds to wider horizons, they considered that new discoveries in the conversion of metals were, as they reasonably said, of more use to the community than spending whole days arguing about the literary battles of philosophers, and perhaps they thought it was a special part of philosophy and medicine, which they had taught previously. They had read in Aristotle that the production of one thing is the decomposition of another, and that it happens with particulars, not universals. They had also read that elements can be mixed and changed utterly when they join together.

They observed that God and nature make nothing in vain, and that a learned man is the best thing in lower nature, by whose skill, working upon nature, nature could produce what it could never do unaided and befift of the help of man, and if this is obvious in arboriculture, in painting, in medicine, and in almost all departments of life, why should it be obscure in case of minerals, so bound up with society, where one often lies hidden in another; they ought to have known that the nature of these learned wits was not to be content with generalities, but naturally to aspire to the knowledge that is threaded through the parts of things and is subject to the senses; they should also have known that circular arguments wander off into vagueness, and there were those among them who were too given to taking their imaginations for reality, but chemists can produce by the art a great and wonderful gain for humanity, which supplies the many wants of mortals, as is plain to the senses and confirmed by public opinion, since many remedies for wounds and diseases have been found among the oils made by the art, as is commonly said of alchemists, with whom they who most seek such health-giving oils agree, for they are the Moses of medicine. The lettered and unlettered alike knew many antidotes that depended on mixing many substances together and digesting for a long time; finally gold was made whose abundance repeatedly relieved the wretched need of the poor. But let me return to the experiments from which I have digressed. An epitaph on gold collected from lead was written in a public church in Rome, if it has not been destroyed in the recent fighting; a few years ago among the Venetians a considerable weight of gold was made from argent vive by means of a very small object no greater than a grain of wheat that, according to three witnesses, turned an ounce of argent vive to good gold, and I spoke to one of those who saw it, and I heard from him that he had carefully inspected the substance that performed the transmutation and that it was an ashen colored medicine.

I come to those things revealed to us on this side of the veil. There is living to this day a men I know who is a friend of mine, who made gold and silver more than sixty times in my presence from metallic substances; he followed not one method, but several, for I saw gold and silver made simultaneously and unexpectedly by making

a metallic water in which neither gold nor silver, nor even sulfur and mercury, the principles of gold, but not in such quantity that it could be repeated, for the reward was less than the expense. I have also seen, as I said at the beginning of this work, gold and silver being formed and separate grains of them poured forth, and in silver no little gold lie hidden; I have seen silver extracted from bronze by strong waters, but not much. And this is one method, as we have said, of making gold and silver, but one should not think much of it, since that which was perfect was got out of imperfect metals, but to make gold from minerals appears more useful; however I have experienced the truth of this matter often in various ways. There is another man whom I think is still alive, for it is generally agreed that he has not joined the dead, who was pleased to produce gold many times from his furnaces, with little expense and in a few days; this he sold to the public offices as pure gold, induced more service to nature and the art than necessary, for he was rich enough and diligent in this important art. There lives to the present day, unless he died a few days ago, a man rich enough to live a fairly noble life in whose hands I have seen bronze turned into silver and gold by the use of a certain juice, made either from vegetables or fruits, and the application of a fierce fire to the metal.

Nor shall I omit to mention what a certain poor man told me occured to him during sleep, which he soon proved by experiment. When he was anxious and did not know where to turn to bear his hunger, for he was oppressed by very high taxes, by a foreign treasury and by a large number of children, he went to sleep and saw a certain heavenly being whose name is in the catalogue of the saints, who taught him the art of making gold in riddles and then hinted at the water he should use for making gold; he used it, at first by itself, to make gold, not a great weight, however, but enough to feed his family, and he also made gold twice from iron, from orpiment three or four times, and by experiment he therefore proved to me that the art of making gold is not an empty one, but truthful. A little later I therefore gratefully wrote a puzzle in hexametric verse, some of which I have quoted above, and to which I have added a prologue and an epilogue, and in the same verses I sang of him who became truly rich.

I have seen someone who turned mercury into genuine silver which

was mixed with gold in two different ways: I have seen gold and silver made from cinnabar from which gold and silver had been removed by certain means; I have seen silver and gold made from pure cinnabar by mixing with a simple oil, but not much; I have often seen mercury that had been removed from bronze and lead transformed into silver and gold. Finally, in earlier days I have seen and touched with my hands gold that was made in three hours time from silver while I was looking on, there being no silver already in either the mercury or the water of conversion, that is, in the prime material of the metals, and by this experience let both those who defend the art of transmuting metals, and those who misrepresent it, contending that it cannot be done unless the metal that is transmuted is converted to the common material of metals first, be convinced.

Chapter 3.

A warning to them who wildly slander those skilled in the art of making gold, who deserve the title of philosopher more than any other investigators of nature.

I thought that these examples, told reasonably and with many instances, whould be enough to inform others and myself, and to satisfy you in part, and that to lay bare what I know for a certainty would remove much uncertainty, for I could not continue if I did not write something for you and to admonish those others who have foolish ideas about things they know nothing of. I shall therefore think it has been worth my while if they whom I have reproved learn from me not to argue, nor to assert things they neither know nor can learn from others, and what is worse and more hateful, to treat as criminal or mad, or to hiss poison at, those who either rightly believe in or skillfully exercise the art of making gold, nor - which deserves both pity and laughter - to ascribe to evil demons what should be ascribed to God the author of all truth, to good spirits, to nature, to art and to industry. For there is no doubt, if we bring the power and cleverness of demons into the picture, that any one skilled in the sublime experiments of Chemistry or knowing

literature can restrain slanderers of this nature by hinting at the doubtful origins of the mothers from whom they were born. For a wicked demon was able to assume the form of Amphitryon for his wife, or of whatever other man a woman judged proper to lie with her and give her children.

The stories of the conception of Alexander of Macedon and of King Seleucis, and of Merlin much later, and much else concerning succubi and incubi are to be found in the writings of our theologians both ancient and modern; the same writings contain dishonesty and deceit and good health derived from the art of medicine lies under the slur that demons are involved in it, and can bring invisible remedies for wounds and diseases, and do many other things recalled by others; these we also recall in those dialogues called Strix upon the Trickery of demons, not to mention the principles of Hippocrates the father of medicine, the author of which was Apollo the false god of the heathen, who had them in ancient times from many demonic oracles, and these principles Hippocrates acquired in the temple of Aesculapius, now burned; of these things we have already spoken, and those principles are still with us, since they are held to be true.

God is the greatest best and first author of all truth, therefore let the slanderers who form opinions from scanty information be reproved by Aristotle. Let them learn from the jurists that those who make judgements without having seen the whole of the law should be blamed as unworthy. Let them learn that they who interrupt a law suit having heard only one side, and often neither, are strongly condemned by Annaeus and laughed at by Claudius Caesar. Then let them learn that gold can be made experimentally without knowledge of the subtleties of literature; but he who has not genuinely followed natural philosophy and understood the things that many turn vaguely over in their minds cannot be a true professor of all the arts of Chemistry. I speak of such things as are often considered, but never decided, which nevertheless are frequently decided by the aid of experiment.

Why should I give the name of philosopher to him who has read certain books of philosophical words, but is totally ignorant of herbs, fruits, metals, stones, and their powers and how to mix and convert them? Is it not more just to apply the name of philosopher

to him who has learned the general principles of nature and has thoroughly investigated its powers in the sublunary realm, and the powers of seeds below the earth? Hence the mind may learn the harmony and discord of things below and their subsequent birth and death, and may rise in admiration of the divine majesty that has given man the gift not only of discovering things hidden and shut up in the bowels of the earth, but has enabled him to establish his home with the help of nature's bounty which delights mortals under many names and soothes it with goods for the outer body.

Does not he who holds to these things surpass the garrulous and argumentative as the body excels the shadow, or the truth fickle and aimless thoughts? For if deeds exceed words and doing great things is better than speech, does not a man of this sort, or he who demonstrates things and brings them to light, who is an impartial valuer of nature, more truly and excellently deserve the name of philosopher, rather than he who is restrained only by his imaginings, or by the commonplaces of dialectics, or by such metaphysical notions as occur to him, ever anxious, never certain, always busy with the usual arguments. Antiquity applied the name of sophist to the latter and of sage to the former, not to noisy Peripatetics, whose dogmas reduce to a feeling from which they are hard put to it to derive their proofs; scorning this feeling those learned in chymistry have a contrary opinion and so obtain the victory, therefore you will see that the Greeks gave the name of sage to those men and made their sayings public not lightly nor without reason and proper inclination.

Among the Arabs, as workers both skilled and ignorant knew, equipment such as the lute, that professors of chymistry generally use, was given the name of wisdom by those we have called learned, and by those who ply musical or instrumental arts. It is known in the society in which we have lived for some centuries that gold is the standard by which all external things, called goods by the Peripatetics and conveniences by the Stoics, are measured; and what is more to be wondered at, many mortals expose their bodies to the danger of death in the pursuit of gold; such godless people who prefer gold to their souls should be totally forgotten. The wicked abuse it, the honest and well-advised use it correctly, and if they have been granted this rarest and most heavenly gift, so that they may give thanks to God, they should not grudge any mortal riches and advantage.

CHAPTER 4.

IF A MAN MAY PROPERLY BE CALLED RICH BECAUSE OF EXTERNAL MATTERS, THOSE SKILLED IN THE ART OF MAKING GOLD DESERVE THE SAME TITLE.

Certainly there was no small dispute in antiquity among philosophers and orators as to who should be called rich, nor did poets ignore the question, witness what was said of Crassus. Are you alone rich? Another might deserve to be called rich in philosophy only, and who would suppose that a man could not be rich in land, or in money lent at interest, or embroidered garments, or gold? Certainly no one will see anything wrong with the man who says, "He is indeed rich who is imbued with the principles of Christ's religion, is genuinely healthy in mind and body, and is endowed with the ability to make gold and silver."

Now he who is entirely lacking in goodness of mind is very poor and far from being rich, nor does he who suffers from bodily complaints commonly deserve the name, nor he who lacks health, or is not safe from war, he who depends on the whims of princes, he who makes merchant voyages, or is always afraid of robbers or an angry sea, he who relies upon rural wealth and often fears unseasonable damage to his crops, he who makes money dishonestly, or loses money at interest, apart from those who are ill-spoken of by the best human institutions, those who suffer the inward bite of a bad conscience, (if they can in any way be properly counted among the rich); even riches inherited from one's ancestors can easily be stripped away; who does not know that bread was begged for after the fall of Carthage, but who, as long as they live, will refuse that art that belongs to the healthy human mind, and who will prohibit whereever he may be, so long as fire is at hand, and certain powders and liquids with which one may make gold?

It is true that the German and Pannonian princes dug it from the deepest caves of the mountains for ages with thousands of men; moreover it is scarcely three years since the kings of Spain prepared a great fleet that, leaving the ports of Baetica and Lusitania, forsook the shore to measure the Atlantic and Indian oceans, seeking

unknown regions rich in gold, whereas he who is competent in the art can, with little expense and great reward, produce it in a few days, whether at home or living as a guest, often under the mere supervision of a servant; and as we have already said, it pleased us to express these golden and silver riddles in verse:-

"Never judge me to be a rich man, rich in land, rich in embroidered clothes, in a lofty mansion, or in a kingdom nor shall I ever be rich if I rely on a Spanish ship bearing treasure from brilliant India across the Atlantic, scornful of the strength of northern and southern winds. However, he to whom the eternal father on high Olympus has granted the desire to do whatever mortals may, if they make pleasing prayers, is rich, as long as his faith is true, he is filled with light, and has a healthy mind in a healthy body, and is fortified by those external riches that seemed to Chrysippus conveniences, not goods. But as the greater part of humankind ever metes out misery to itself with gold and silver, nowadays the richer man is widely thought to be he who enjoys full coffers, and a wealth of either metal, who sends the coins gained at home to foreign realms, so that their number multiplies upon the opening of a letter, and adds fresh interest to new wealth, which a prince or a greedy people can plunder and submerge in the depths of the sea, or snatch away in unjust wars. To me the rich man will always seem to be he who draws an amount of silver and gold from his own furnaces that exceeds the amount on the banker's table each year for a hundred years, without wicked wiles, without spiteful fraud, requiring small expense and short spaces of time. This wealth neither kings nor peoples nor angry enemies can take away, nor the harshness of the huge sea, for anyone who likes can turn the sweepings of the earth into yellow gold if he knows how."

Therefore it appears that as far as external matters are concerned, he who has the power of making gold would in vain be called the Pandora of ancient fable, in vain be shown the horn of Amalthea.

Chapter 5.

Artificial gold is not false (which it would probably not be lawful to sell), but genuine and is not worse in quality than native mined gold, but often better.

He who makes gold for the advantage of either the healthy or the sick brings great increase of wealth to mortals, as long as those who are skilled in literature (only) understand that the gold made by art, if it is genuine, bears exactly the same relationship in its essence and qualities to the gold in common use as that does to the gold that craftsmen remove from the caverns of the earth or collect from the sands of rivers, and that in common use has the same properties as that taken from the metal-diggings; the opinions of those who strove to reconcile differing beliefs, allowing that the one could be made while denying that the other could, have been exploded.

For you never find a natural body without qualities or properties, or if you prefer, endowments, nor, if we are seeking the nature of something, shall we ever discover its essence if its properties are removed.

Aristotle was of the opinion that those properties which although they are many and various he called by the one word "sumbebetoka", or external and accidental properties assist us in knowing what is, that is, the nature of things. If gold made by art has the same nature as gold born of nature it will consequently have the same properties, and thus it will be of the same value and should be sold for the same price. All the accidental properties, I say, by which those skilled in handling gold can recognize it, not some or most of them, for it one or the whole is lacking, it could be under suspicion of falsity. And although they talk of custom, if you consider carefully they allow false gold and silver, usually called adulterated, to be sold, and it is worth what the law says; nevertheless when one is made in full view, and the other is born in closed recesses, it is a dangerous matter, therefore I will never agree with their opinion, because the less wise, who form the greater part of humankind, are easily deluded.

Moreover the path of false and stolen money made from fraudulent

gold and silver, known as adulterated, is strewn with fraudulent men. But although there are many different ways of making and forging metal, and different arts by which both can be prepared, for the one always comes first and the other follows, nevertheless imposters who already have false metal in their possession seem to find the path of wicked deception easier than those who try to pervert the genuine metal by mixing it with a worse one; the means for evil-doing should never be increased for evil men. Perhaps it is for this reason that Albertus Magnus wrote that the art that changes metals is genuine whereas he said that it was false if artificers were deceived by the mere color of gold and silver and thought they had endowed lesser metals with the yellow of gold and the pale whiteness of silver, exulted like those competent in the art, and obviously deceived the buyer.

Experienced men can agree that artificial gold, though not native, can be shown to be genuine when mixed with foods and antidotes, or digestive waters, and not different from that dug from the shady bedchambers of the earth, while the fictive, false, and adulterated is not; and it is much more useful than that minted by princes, or stamped R.P., and because many do not know this, I shall try to explain further; for I have known those who although they knew how to make gold nevertheless refused to teach their friends and relatives, fearing that they would abuse the art, that is, they were afraid that artificial gold, whether made from argent vive or something else that might be thought harmful if eaten might overcome the nature of gold. Perhaps they had heard that "he brewed lethal weights of argent vive, so that its increased power might compel swift death' and they could easily have read the books of those who claimed that the properties of native gold, especially those of bringing gladness and warding off leprosy, were not to be found in artificial gold, something that Timon was as right to rebut in "Res meteorologica" as he was wrong to allow when he said that astrological signs were helpful in making gold.

I shall free from all anxiety those who harbor such doubts, for if the gold made by art is genuine gold, it will have the nature of true gold, and therefore all the external and accidental properties that naturally flow from it, as we have already shown, there-

fore it brings gladness if that is the function of gold, and repels leprosy if that is one of gold's properties.

But perhaps they will say that argent vive and other poisonous things enter the gold that art creates. I shall affirm that gold is made from the very same things in the lowest parts of the earth. Finally, I shall submit that gold can be artificially made in many ways, not just one. I shall add that although poisons are employed in finishing the task, they are to be counted tools of transmutation, and do not affect the nature of the thing made. To this I shall also add that argent vive when it is turned into solid silver or gold so that it ceases to be argent vive, loses its deadliness, whether this comes from some hidden property, or, as Albertus shrewdly says, arises from its coldness and moistness; nevertheless it decreases the harm it does to the nerves, although there are some who say that argent vive is not of a cold nature, but a hot one, and contend that this is easily seen from some of its other qualities.

Nor should I omit to say that all that is said to be poisonous is purged by many conversions, thanks to the fire, and puts on another nature, which indeed is what must happen in the subterranean caves where sulfur, bronze, and argent vive come together to produce the substance gold, because although those who hold the contrary opinion consider it most heathful, they still consider the things it is made from before it ripens and obtains its own nature as harmful.

If you say that gold prepared by nature has certain curative properties lacking in that prepared by art, I shall reply, Who can come to a conclusion concerning the nature of gold while he is preparing it? Who can investigate nature's midwife to learn her rule, what is drawn in, what is driven out, what is free of any suspicion, what loses its poison when it has just entered the work, what is freed from poison during preparation, or after it. This can be supported by the example of animals that thrive on eating what kills other animals to eat, the cause lying in the differing abilities to digest and transmute in different kinds of living creatures.

And again we might employ the example of poisonous things that become beneficial by mixing and preparing, as is quite clearly found in the case of theriacs and antidotes; the contrary also occurs, harmful things resulting from sound ones through no foreign noxious

substance was added. Let a hen's egg be an example, for it arouses nausea in most people if raw, if lightly cooked it is a wonderfully healthy portion, if hardened by too much heat, it is reckoned a very noxious foodstuff. Since artificial gold is not distinguishable from natural by human faculties, otherwise it would not be, nor could it be said to be, of the same species, if it were distinguishable by different properties, such as lead to the recognition of a substance, but since it cannot be distinguished, there is, I tell you, no danger, nor fear of danger. You are entirely ignorant of whether the gold you put to cook in the pot, that you file, hammer, and divide into the smallest morsels, that you plunge in seething water to boil, has been ripped from the bowels of the earth, or made by the skill of man. Let us add that gold was made from time to time in antiquity, otherwise the art would not be practised by so many, but it would everywhere have been mocked and rejected by common consent; there is still to be found among the living a man who boasted that he had eight hundred full books on the art, and had besides read more than three thousand and seven injunctions about it, and as I have said, it was made in antiquity, as we have proved from experience.

What reason or argument do you have for separating artificial gold from native? No sign or stamped brand, for antiquity like our own age stamped gold with the mark of its principal men, and took it to the public offices to be tried. Not its color, for the touchstone, like an honourable judge, gives neither side the verdict when the color is the same. Not its weight for the tongue of the balance does not more. Not its softness or smoothness when neither resists bending and pulling. Not its effects, for whether gold is eaten or drunk you cannot ascribe to it the qualities someone else has ascribed to something else without good reason; if several things together, not separately, are required for a certain effect, then if different effects are produced you will certainly not know what substance to ascribe the difference too, unless you have investigated the various qualities of those things that have combined, for there will be occasions when what is ascribed to one ingredient should be ascribed to another, and this will occur more often the greater the mixture or the larger the number of ingredients.

So if you do not know how to distinguish the good gold you have

obtained from nature's womb from that which skill and craft have borne, you will never drink a toast to real gold. For, considering the gold called natural, either you consider it all harmful if a certain part of it is deemed unwholesome, or all is wholesome, or all doubtful, but since as we have seen, no legitimate distinctions can be made, if you cannot distinguish the one from the other either by the touchstone, or the balance, or even by that water called by the name of the partition it effects, separating silver from gold, you cannot say that either of them is not harmful.

What? Even if all gold is beneficial, that which is stamped by our princes and republics for use in buying and selling should be reckoned harmful, for copper is mixed with it, as the color of the Heraclian stone indicates. Other things are mixed in as well, including that harsh artificial salt that is falsely called ammoniacal, that is, sandy. Niter is sometimes added, and the poisonous part of argent vive that gets its name because it is sublimed, whose poisonous qualities are increased by boiling; who does not know "on altars (?) mildew and leavings that harm the digestion". And besides that there are other things that we call noxious that gold and silver smiths employ to put a shine on golden coins, for they color gold that is pale by nature so that it glitters and sparkles more. Enough of wholesomeness, now we shall write only of the art and refute common false opinions.

Chapter 6.

Several pieces of advice for those who eagerly strive to make gold by the chemical art, and an answer to the common question why those who occupy themselves with the art of making gold are poor.

I should like to warn those who seek to make gold artificially not to try experiments that are beyond them, nor neglect more precise studies, nor to promise themselves great wealth, nor to seek principalities and kingdoms, deluded by vain hope. God does not allow it to all men of small means (as it is commonly said) who either desire glory, or practise mercantilism, nor to those who

have great riches, nor to those who rule principalities and kingdoms, nor even to those who follow literary studies, hoping to equal or outdo the glory of the ancients; the matter should be considered as uncommon, and very difficult, for God gives his gifts according to his own judgement, not ours.

Now if they who prepare gold and seek to transmute metals turn vain and harmful things over in their minds, if they promise themselves too much, and, as the proverb says, build castles in the air, they should realise that they are easily deceived and deluded, both by themselves and the deceitful badness of dishonest spirits and men. Some time ago I remember a certain learned friend of mine who was told by an oracle that if he sought to be adept in the craft of making gold, he should not abuse it for vainglory or harm, and that it would be allowed him if he mastered himself and became healthy in both body and mind. I know another, who told me that he once made genuine solid silver from liquid mercury, using the sap and leaves of plants, and that he sold it to those who were skilled in the art of trying metals, then, using the same leaves, he tried again in vain, and what he had done once he could never do again, however often he tried.

I knew another, who is still alive, who, after he had made silver and gold about fifteen times by the art, lost the ability, and, having had a revealation in the quiet of his fireside, realised that it was due to some fault in his ungrateful soul, and hence we may learn the truth of the apostle's words, that he who sows or reaps is nothing but God gives the increase. A certain man told me that he had once made a great quantity of gold and silver, then, using the same materials, he made some, but a very small amount, so that his loss greatly exceeded his gain. It came into my mind that the loss could have been avoided if he had tried to attain the better metal from bronze instead of silver, and he should have made the attempt believing that nothing at all would happen, and then in some wonderful fashion the thing he thought he would not attain might come to pass. (Failure occurs) sometimes by disappearance and sometimes by many intertwined causes, nevertheless it should be clearly understood that impediments arise from reasons other than human ability.

The same man affirmed that he had learned from a friend who had

made the best silver from cinnabar that after he had undertaken the better work many times, but always in vain, he had realised that the results confirmed this reasoning. Now when you see an abortion among these substances torn from the caverns of the earth, it seems to you that it must be a great omen. Anhaeus Seneca says that it is with these substances as it is with our own bodies, that their moisture often suffers harm, whether from a blow, or shaking, or decay, or cold, or the corruption of its nature by heat, or from too great or too small an application of heat, or from the ignorance or carelessness of the worker, nor should I omit the many evil deeds of demons, but even if everything you desire should happen according to your prayers, if you do not have the grace of God, you will lose your reward; and at some time you may make a thoughtless boast, as we recall in our riddles, but which we put into verse without the complexities of a riddle:-

"Though nature keeps the even tenor of her way, though neither the workman's hand nor his heart turn aside, yet nature may produce many monsters if she is suffocated by the heat of too much fire, if she lacks it, or suffers too much cold. Old Mother Earth continues to give birth from her womb, and the worker's weary mind is borne through trackless ways, too intent upon the stony task, and so his tired hands turn from the right path. Should all that I have listed be in order, all is nevertheless vain unless the Omnipotent desires; without this ever in vain are the labors of nature and art, and neither time nor might can bring these things to fruition. Meantime the evil Demon ingratiates himself and throws all into confusion, unless restrained from on high; for I remember. I remember that I changed black to yellow against the order of nature; the metal at once shone in my eyes, the genuine substance glittered, the flame spread the conquering calx upon the breeze, and suddenly it dispersed with a little heat, and with the blowing of a little breath, and vanished on the thin-bodied wind. When the light shone and the mist was cleared from my mind I was amazed and at the same time looked to Olympus for the reason. For the sign of the cross repelled the black mockery of Hell, the world was restored to its early vigor, so great is our piety, so great the power of the king who from his high cross saved humanity, so that men may regard the

beginnings of their ventures calmly and succeed, having once begun. With experience you will gain more of both metals than the mines of Rome or Illyria yield, more than the Asturian dug for in Callais' caves, nor shall you then wonder at the gold of Phrygia's king."

I may therefore usefully repeat what I have already said, for the ignorant cannot learn too much, nor the stubborn be too much warned. I may usefully repeat, therefore, that on that account the slanderers of the art cannot cook up false charges. For no sensible person would speak out against agriculture or medicine because the harvest of the fields was lost, or because the sick died, for the principal causes upon which they depend are obviously not skill alone, but nature and the will of the divine, nor should you shrink from making gold because the results are trifling or not very rich. For the rules of the art are not eternal nor confirmed by all. Why then do you not censure the necessary and basic art of agriculture when its returns are nothing? Why do you not reject the ancient and useful art of curing the human body when it is not successful? It is surely because we know that the promised effects are often thwarted for various reasons; the writer Cornelius perhaps illustrates this from his own disciplines.

For he says that medicine promises health to the sick, as agriculture promises food for healthy bodies. Neither food nor health may result, but are promised, he says carefully, in case of failure to produce results; the professor of the chemical art promises gold and silver in the same way. Whether or not he is more confident of making gold as he wishes than Hippocrates of bringing the sick back to health, the task is full of danger; for the embrocations that antiquity wrote would be efficacious are not always so, nor do simple medicines always deliver what they promise; nor do the colleges of medicine prevent the sick, whom they always assist, from dying, however much they promise a cure.

Add to this that few attain the sublime goal of making a large weight of gold at small expense. For it is God's peculiar gift that it is unimportant to most that they make much gold and gain much reward. To have made a little is what matters. I speculate that this is the case so that the truth that metals turn into each other may be recognised. The results of the great work do not give rise

to riches, even if you can prepare gold in six hundred ways, for there are those who can scarcely bear the expense, others who suffer losses, and others who have no fixed station or income, but a variable one, so therefore you may easily answer the question that is commonly asked, Why are those who make gold so often in want and unable to enrich themselves?

For either they make too little gold, or if they make much it is at great expense, or their experimental results vary, something that happens often, not conforming to any general law. Or the fear of fierce and greedy princes disturbs them, or the right place is wanting, or they do not have retainers and servants. I omit the absurd and fickle credulity of many, joined with lack of skill, and the sly wickedness of fraudulent artificers, with which you cannot justly besmirch the art. But why be surprised? Often as the furnaces give rise to loss, not gain, the same occurs in the mines, both in our own times and in antiquity. Therefore Demetrius Phaleraerus misguidedly reproves seekers for gold in the depths of the earth, saying that they waste gains in the hand for uncertain ones, are incompetent in their investigations, and lose what they already possess. Nevertheless, even if everything that you have prepared with great care and great expense is favorable, and all that you have desired in your prayers, unless God's decision is also favorable, you will labor in vain.

One can see this in the workings of nature, because in the conception and birth of mortals an abortion may occur in various conditions of feminine sterility and weakness of the masculine seed, and for many other reasons, and above all the presence of the divine will is necessary for the child who lies hidden in the womb to come forth into the light. How much greater is its importance in the useful arts. In short, the art, which is always sure and unmoving, relies on no conjectures, but there is nothing so certain and unshaken that it is not liable in great part to change in circumstance, nor totally subject to the divine will. When you feel inclined to make gold, beware of greed and elation and always be in dread as to whether or not the gift will benefit you, or cause you suffering, and meditate often upon that true and beautiful aphorism of Augustus "There are many things that God gives in anger that he

does not concede of his grace." Therefore first of all give thanks to immortal God and assign to him as much as you are able, then with all modesty accept the heavenly and sacred gift and use it dutifully to the honor and glory of the Holy Trinity, which is one God, and for the especial benefit of other men.