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GEN. A. W. GREELY, U.S. ARMY

(Gold Medallist of the Royal Geographical Society, and of the Société de Géographie de Paris)

THE
National Geographic Magazine

VOL. VII JUNE, 1896 No. 6

THE SEINE, THE MEUSE, AND THE MOSELLE

By WILLIAM M. DAVIS

Professor of Physical Geography in Harvard University

The three rivers.—The narrow basin of the Meuse lies between the widespreading branches of the Seine on the west and of the Moselle on the east. The slender trunk stream of the Meuse, with hardly a tributary on either side, is like one of those tall, close-trimmed poplars that the traveler often sees along the national roads of France, and the comparison is not altogether inapt, for there is good reason to think that the Meuse has really been trimmed of certain branches which have been diverted to the basins of its larger neighbors. Its basin is, indeed, like the

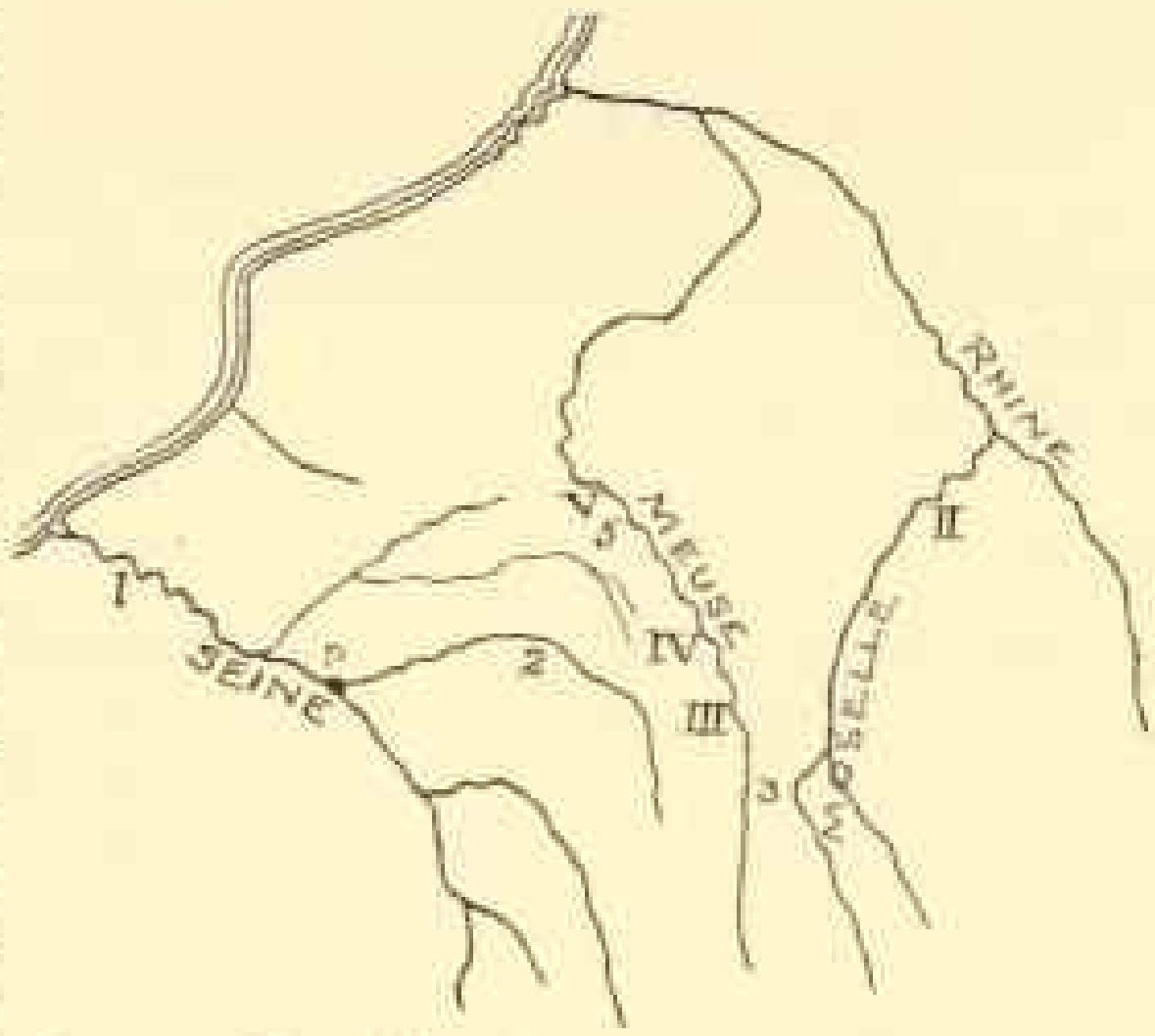


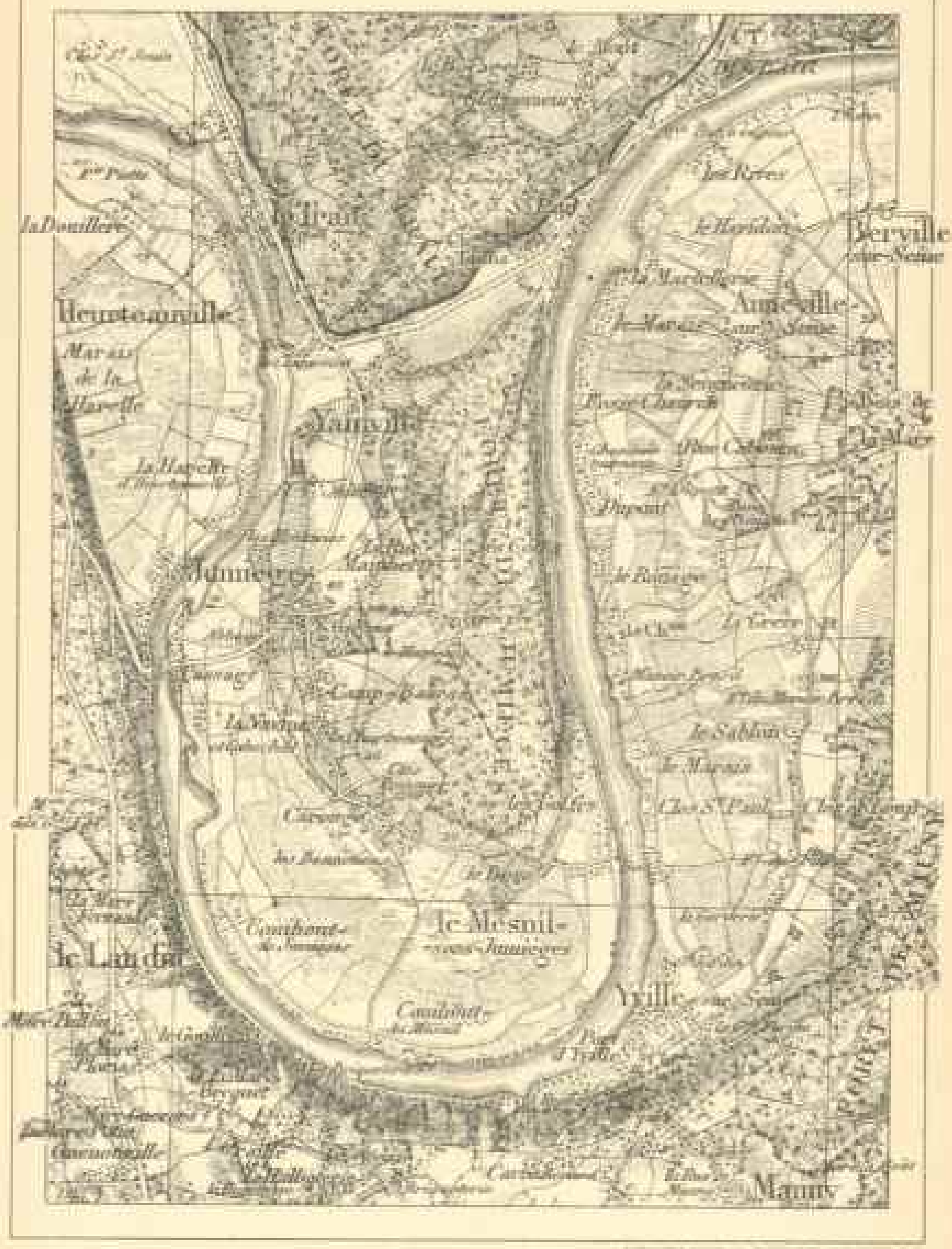
FIGURE 1.—The Arabic numbers on this figure show the different locations of the other figures used in this article. The Roman numbers show the location of the page plates.

dwindling territory of a petty prince between the encroaching kingdoms of powerful rulers on either side. The evidence of this will appear when we examine the characteristics of the three rivers.

The vigorous meanders of the Seine.—The Seine, after gathering in its upper branches both above and below Paris, pursues a strongly meandering course to the sea. Its lower valley is sunk with rather steep sides in a comparatively even upland, which itself is a surface of denudation. Although without complete proof on this point, I am led to suppose that this gently rolling upland is an uplifted peneplain—that is, a denuded region that was once reduced to a surface of moderate relief close to its controlling baselevel, and then raised by some gentle process of elevation to its present altitude. During the development of the peneplain the Seine, the master river of the region, must have attained an extremely faint grade, and at the same time have taken on the habit of swinging from side to side in comparatively regular curves or meanders such as are characteristic of rivers with gentle slope. With the uplift of the region the meandering river would proceed to incise its channel beneath the uplifted surface, and thus Ramsay accounted for its peculiar intrenched meanders many years ago. They seem to be features of old age retained in youth of the present cycle of denudation as an inheritance from an advanced stage of a preceding cycle.

In the second cycle of denudation, now in progress, the belt of country inclosed by lines tangent to the outer meander curves of the Seine seems to have broadened to greater width than it possessed before the uplift of the region occurred. The evidence of this is seen in the long sloping descent of each tongue of land which enters one of the river curves and from which the river seems to have receded, while the outer side of the swinging current undercuts a bluff of steep descent from the upland, as if the river were pressing against it. If the meandering river had cut down its channel vertically the slopes on the two sides of its present course should be symmetrical.* The reason for the increased breadth of the meander belt appears to be in the increased velocity given to the river in consequence of the uplift of the region. Many similar cases might be mentioned, but none show more clearly than the Seine the special features of an invigorated river. The great curves around which it swings fit in nearly all cases close to the bluff on their outer side. It is an able-bodied river, a river of a robust habit of life.

* See note by A. Winslow in *Science*, 1883.



VALLEY OF THE SEINE, NEAR DUCLAIR

Sheet 31, Map of France, 1 : 80,000

The case of the Ste. Austreberte.—Not far below the city of Rouen and precisely at the small town of Duclair, on the north bank of the Seine, there is an interesting little occurrence strongly confirmatory of the invigorated habit of the swinging river. Duclair is situated on the outer side of a large north-turning meander. Into this north-turning meander descends a long sloping spur from the upland south of the river; east and west of Duclair similar long sloping spurs descend from the northern upland into the adjacent south-turning meanders. On looking closely at the map of the country or, still better, on looking over the region itself from the top of the bluff at the back of the town, it is seen that the western of the two northern spurs is obliquely cut across by a narrow, dry, flat-bottomed valley, which is just in continuation of the course of a little stream known as the Ste. Austreberte, coming from the northeast and mouthing in the Seine at Duclair. The dry valley was evidently at one time followed by the lower course of this stream, and it is still followed by the highway and the railway, for which it serves for a "short-cut" on their way down the Seine. (See Plate XXI.)

The question then arises, Why has the stream deserted so well prepared a path? The answer is not far to seek. The change evidently occurred because the Duclair meander of the Seine pushed its inclosing bluff further and further north until the river cut through the ridge that separated it from the Ste. Austreberte and thus tempted that stream to desert its lower course. This little fact, taken in connection with the slopes of the dovetailing spurs, fully justifies the opinion that the Seine is a most vigorous river, not only competent to swing around the curves of its former meanders, but demanding an increased radius for every curve, and thus widening its meander belt. Here and there, it is true, the swinging course of the river departs somewhat irregularly from the round curves of its valley, as if the river had shrunk somewhat away from the strong curves which it once followed. This may perhaps be explained as the result of the diminishing velocity of the river, now that it has cut its new valley deep below the adjacent upland and close to the controlling baselevel, but the irregularities are exceptional and they need not be further considered. As a whole, the river may be regarded as an able-bodied stream turning vigorously from curve to curve on its way to the sea.*

*An accident of the Ste. Austreberte type is found in the valley of the Marne a short distance below Meaux, where the Grand Morin now joins the Marne at Isles-les-Villenoy, abandoning a former lower course which led it to Pecy.

The robust habit of the Moselle.—Let us next glance at the lower course of the Moselle. Passing below its upper branching course and following it below Trèves through the highlands to the Rhine, we find here again a most serpentine valley incised beneath the general upland of the region. Ascending from the valley bottom, which the traveler ordinarily follows, to the level of the inclosing upland, it is even more manifest here than in northwestern France that we have to do with an uplifted and well-dissected peneplain. The surrounding region is one in which the rocks are greatly deformed, possessing all the characteristics of mountain structure, but few of the characteristics of mountain height. Indeed, the upland between Trèves and the Rhine is one of the best examples of an uplifted peneplain that I have seen. The gently rolling surface shows little regard for the great diversity in the attitude of its rocks. Here and there it is still surmounted by low, linear eminences, such as the Idarwald and the Soonwald, following the strike of resistant quartzites. These I would call "monadnocks," taking the name from a typical residual mountain which surmounts the uplifted peneplain of New England in southwestern New Hampshire.

But how has the Moselle come to follow a meandering valley deeply incised in the peneplain? It is manifest, from what is now known concerning the geological development of land surfaces, that during the later stages of the denudation of the middle Rhine highlands the streams of the region must have flowed idly along meandering courses with gentle slope in channels little below the surrounding surface; but at present the streams, and especially the master rivers of the region, have deeply incised courses inclosed by steep-sided valleys. Clearly, then, the region has been uplifted since the denudation of the peneplain and is now well entered in a second cycle of denudation. The meanders developed in the later stages of the previous cycle of denudation are inherited in the early stage of the present cycle.

It is worth noting, however, that there seems to have been a pause during the general elevation of the region, for the valley of the Moselle may be described as a narrow, meandering trench cut in a wide-open, flat-bottomed trough, the trough being sunk well beneath the general surface of the adjacent upland. The same sequence of forms may be clearly recognized in the valley of the Rhine, particularly in the neighborhood of Bacharach, where the old river alluvium still lies on the floor of the uplifted trough, although the existing river trench is sunk several hun-

VALLEY OF THE MOSELLE, NEAR BERNCASTEL

Sheet 512, Map of the German Empire, 1 : 100,000

dred feet beneath it. It must therefore be concluded from the relation of the upland, the trough, and the trench that the uplift of the region to its present height was accomplished in two movements, and that a longer interval of comparative rest followed the first movement than has yet elapsed since the second; but it must also be understood that the time that has elapsed from the first of these movements to the present day is very short compared to the long cycle of denudation during which the ancient mountains of the region were worn down to the general surface of the peneplain.

The meanders which the Moselle now follows in its serpentine trench are therefore to be regarded as the inheritance of a meandering habit that it acquired on the floor of the trough; but here, as in the case of the Seine, the present width of the meander belt is somewhat greater than the width of the former belt, judging from the difference in the slopes of the interior spurs and the steep bluffs opposite them on the outer side of the river curves. The Moselle, like the Seine, swings around its curves with a robust, full-bodied action, nowhere hesitating to make the circuit with strong pressure on its outside bank.

The two cut-offs above Bernastel.—At several points the spurs from the upland have very narrow necks through which the valley railway passes in "short-cut" tunnels. Although I have not found any example of the diversion of a side stream by the lateral growth of the river meanders, yet such a change is imminent just above Pünderich, where the ridge between the Moselle and the Alfbach is reduced to a very narrow measure. But it does appear that just above Bernastel the Moselle has played upon itself the same trick that the Seine has played upon the Ste. Austreberte. The Moselle at this point has an exceptionally straight course, but to the right and left of it rise two isolated hills, inclosed by troughs of horseshoe shape whose outer slopes rise to the general uplands. From the study of the maps at home I had come to the opinion that these troughs represented former meanders of the river, now abandoned in favor of the more direct intermediate course, and an inspection of the district on the ground has confirmed this belief. I presume the fact is well known to students of river habits abroad.* (See Plate XXII.)

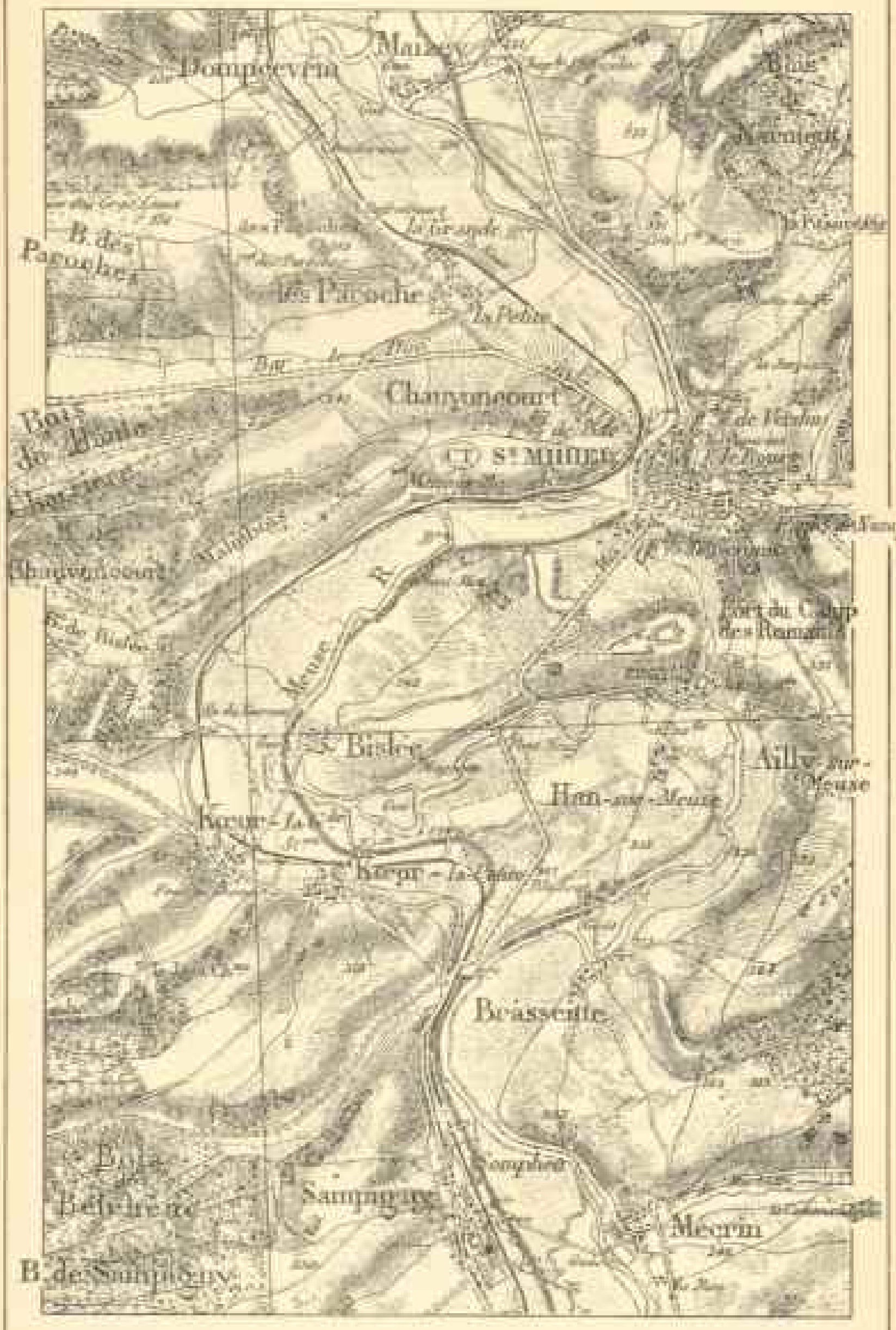
Nothing can be more satisfactory than the agreement shown between the features of these abandoned meanders and of the

*See, for example, H. Grebe, Ueber Thalbildung auf der linken Rheinseite, Jahrb. k. preuss. geol. Landesanst., 1885, 137.

meanders still occupied by the river farther down the trench. The radius of curvature is essentially the same in the several cases. The slopes on the outsides of the troughs have the characteristic, bluff-like descent from the upland. The isolated hills are the ends of interlocking spurs, now dissevered from the uplands by the cross-cut of the river; the ends of these hills that project into the horseshoe troughs have the comparatively gentle descent of the spurs that are elsewhere found projecting into the actual meanders. Not only so; the eastern branch of the southern horseshoe is just opposite and in line with the western branch of the northern horseshoe. There can be no doubt that the vigorous Moselle has here so earnestly swung against its outer bank that it has actually shortened its own course by cutting through the narrow necks of the intervening spurs. Perhaps I am giving too much emphasis to this occurrence. It is not a great rarity, for similarly abandoned river meanders are not infrequent in other plateaus. They are known in the plateau of Würtemberg, where it is trenched by the Neckar at Lauffen and just above, and in the plateau of western Pennsylvania, trenched by the Ohio and its branches. It is not, however, the mere occurrence of these cut-off meanders, but rather the lesson that they teach, that deserves emphasis. They all indicate strong river action. The Moselle must therefore be regarded as an able-bodied, vigorous river, like the Seine.

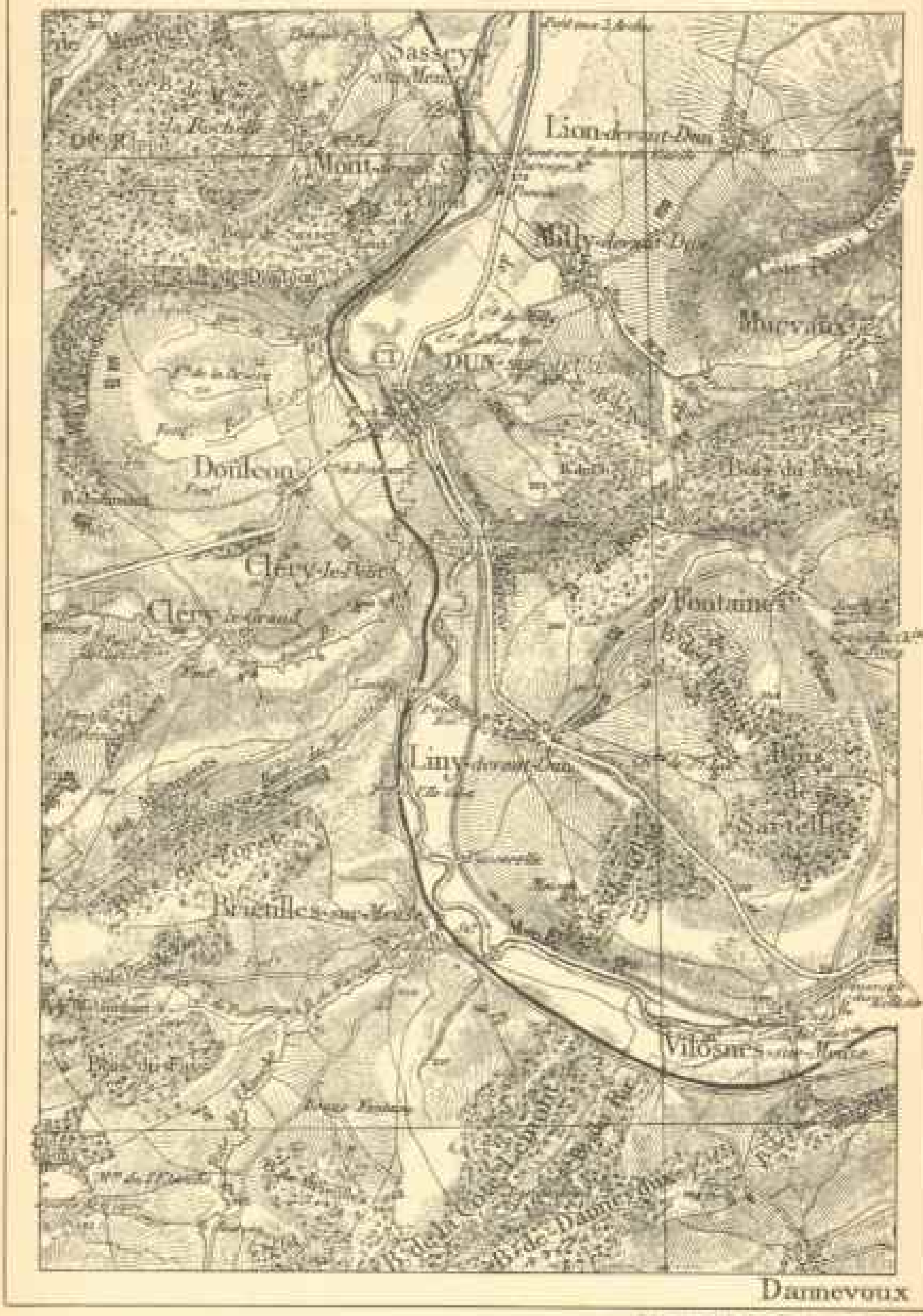
The staggering Meuse.—Let us now look at the Meuse. From some distance above Commercy, down stream as far as Verdun and beyond, this river, like the others, follows a well-defined meandering valley, incised beneath uplands on either side. As before, the slope of the bluffs on the outer side of the valley curves is comparatively steep, while the slope of the spurs on the inner side of the curves is relatively gentle. Just above Commercy, near Sarcy-sur-Meuse, one of the spurs is almost cut through and is now connected with its upland by a very narrow and low neck, which alone separates the flood-plain of the curving valley on either side. The railway and canal both save distance by cutting across the low neck. At Dun-sur-Meuse the neck of a former spur is entirely cut through. It now stands as an isolated hill surrounded on all sides by the flat valley floor.*

*The état-major map, 1:80,000, suggests three other abandoned meanders: one east of Lisy-devant-Dun; another northeast of Letanne; the third southwest of Mouzon. The cutting of some of these meanders may have occurred early in the history of the valley. At Koeur-la-petite, below Commercy, the map shows the railway and canal running through a depression in the neck of a spur that extends toward Han-sur-Meuse, and I suppose that the Ste. Austreberte case is here paralleled.



VALLEY OF THE MEUSE, NEAR ST. MIHIEL

Sheet 31, Map of France, 1 / 80,000



VALLEY OF THE MEUSE, NEAR DUN-SUR-MEUSE

Sheet 35, Map of France, 1:80,000

It is manifest, then, that this valley was excavated by a river hardly less vigorous than those that cut the valleys of the Seine and the Moselle, but the vigorous river that was once here is now nowhere to be found. The floor of the valley is at present occupied for the most part by broad, green meadows, instead of by a free-swinging current of water, and the only stream to be found is the little Meuse, wandering here and there on the broad meadows and staggering with most uncertain step around the valley curves. It wriggles from place to place, now touching this side of the valley, now that, swinging indifferently against the steep bluffs and gentle slopes of the spurs, sometimes even running for a short distance up the valley in its irregular path. Is it not then clear that since the time when this winding valley was made there has been a great diminution in the volume of water that follows it? No other conclusion seems admissible; and hence a reason for the loss of volume must be sought. (See Plates XXIII and XXIV.)

The loss of volume cannot be ascribed to any climatic change, for that should have affected the Seine and Moselle as well. May it then be ascribed to a change of the area drained, whereby the Seine and the Moselle gained the drainage area which the Meuse lost? If this were so, the Meuse would have become smaller and smaller, while the Seine and Moselle grew larger and larger. The dwindling Meuse would have lost the power of swinging boldly around its valley curves; it would have fallen into the present timid habit of staggering, after the fashion of other small streams, but at the same time the Seine and the Moselle would have been confirmed in their vigorous habit of swinging freely around the curves of their valleys. Is it possible, then, that the side branches of the Meuse have really been trimmed from the trunk river, and that the trimmed branches have been engrafted into the systems of the Seine and the Moselle?

The migration of river divides.—The question thus raised leads to a consideration of the general problem of the shifting or migration of river divides, a subject that is of particular interest to the student of physical geography. At first sight one would be inclined to think that the crest-line of a divide between adjacent river basins would merely waste lower and lower as it weathered away, without shifting laterally, and therefore without causing any change in the area of the adjacent drainage basins. It is probable, however, that this simple process is of very rare occurrence in nature. It is much more likely that the line of the

divide will move more or less to one side or the other as it weathers away, on account of the unequal rate of wasting of its two slopes. The possible causes of unequal wasting are various. The declivity of the two slopes may differ, in which case the steep slope wastes faster than the other and the divide is very slowly pushed toward the flatter slope. The rocks underlying the two slopes may be of different resistance; then the weaker one will, as a rule, waste away the faster, and the divide will gradually migrate toward the more resistant rocks. Again, the agencies of erosion may be of different activities on the two slopes; one slope may have a greater rainfall than the other, or may suffer a greater number of alterations from freezing to melting. Although the last is generally a subordinate cause, it probably contributes in a small way to the solution of the problem as a whole.

The shifting of the divide as thus explained is generally accomplished by a slow migration. In some cases, however, when the divide is pushed to the very side of a stream whose basin it inclosed, then a little further change diverts all the upper drainage of this stream into the encroaching basin, and with this change the divide makes a sudden leap around the upper waters of the diverted river, after which the slow migration may be resumed. The movement of a divide may therefore be described as alternately creeping and leaping.

Whether this process is of very general importance or not can hardly be decided at the present time; but there are certain regions in which its application is most illuminating to the studies of the physical geographer. Philippson has brought the subject to general attention in his *Studien über Wasserscheiden*, where a full account of what others have done up to 1885 may be found. Oldham has told how certain headwaters of the Indian rivers are pushing their divides through the innermost of the Himalayan ranges, and thus acquiring drainage area that formerly belonged to the interior streams of the elevated Thibetan plateau. This example is one of the best in which the process depends chiefly on the unequal declivity of the slopes on the two sides of the divide. Heim has described the depredations of the Maira in beheading the upper course of the Inn, thus accounting in a most beautiful manner for the little lakes at the head of the Engadine valley, where this contest is going on. The special map of the Ober-Engadine, published in 1889, on a scale of 1 : 50,000, by the Swiss topographical bureau, gives

fine illustration of the significant features of river interaction in this region.

A remarkable case of river diversion occurs in the shift of the course of the Vistula from its former path down the valley now occupied by the Netze to a more northward course, by which it flows directly to the Baltic sea, the point of change being at the town of Bromberg. This is well illustrated on the Prussian topographical maps, and has been described in a general way by various writers on the geography of North Germany. Whether it was caused by the spontaneous interaction of streams competing for drainage area or not, I shall not at this distance venture to say, but shall hope to find a full explanation of the change in a forthcoming essay by Berendt. Jukes-Brown has described an interesting case in England, where the Trent captured the headwaters of the Wytham, and in a recent volume of the *Geographical Journal* of London I have attempted a more general treatment of the same region. Readers who wish to follow the subject into examples of greater intricacy may find some problematic examples in the rivers of Pennsylvania and northern New Jersey.*

In the general discussion of this problem we should recognize two divisions. First, the processes by which it is accounted for, these having just been summarily described. Second, the topographical forms by which its occurrence may be recognized, distinction being made between examples occurring in the remote or the recent past and others likely to occur in the near or distant future. Illustration of the second division of the subject can best be given by describing the concrete case of the river Marne near Châlons, than which no better example has come to my notice anywhere in the world.

The case of the Marne below Châlons.—In the province of Champagne the Marne drains an extended interior lowland inclosed by a forested upland on the west. The lowland is the product of comparatively rapid erosion during late Tertiary time on weak upper Cretaceous strata. It is for the most part covered by extensive farms. The upland stands where the lower Tertiary strata have, during the same period of time, more successfully resisted erosion. As the dip of the strata is gently westward, the eastern margin of the upland is marked by a steep escarpment. The Marne gathers many branches from the lowland, and escapes on its way to the sea by a deep valley cut through the upland.

* The National Geographic Magazine, Washington, I, 1889; II, 1890.

In this valley it receives two branches on the southern side, to which special attention should be given. The first is the Surmelin, whose head is found in the upland near its eastern precipitous margin; but, curiously enough, although this stream of course diminishes toward its source near Montmort, the valley that it occupies maintains an almost constant width some six miles farther, nearly to the escarpment of the upland. The second branch is the Petit Morin. This, like the Marne, heads in the lowland east of the upland, and also, like the Marne, escapes by a deep and narrow valley through the upland. The lowland area that it drains is, however, very small, and for about ten miles from its head there is an extended marsh, known as the Marais de St. Gond, lying partly on the lowlands and partly in the entrance to the narrow valley in the upland.

In searching for a reason for this arrangement of the Marne and its two branches, it is important to notice that if the branches were prolonged eastward they would both lead to streams, the Soude and the Somme,* flowing for some distance on the lowland toward the heads of the branches, but then turning northward and entering the Marne directly.

The beheading of the Surmelin and the Petit Morin.—In explanation of all these facts let it be supposed that the two pairs, Soude-Surmelin and Somme-Morin, were once actually continuous streams at a time before the lowland was eroded on the weak rocks east of the upland, and let the verity of the supposition be tested by the likelihood of a natural, spontaneous change from that condition to the present.

When the paired streams flowed westward, they, like the Marne, must have run in the direction of the dip of the strata; hence they may all be called *consequent* streams. They must all have passed from the weak Cretaceous strata to the resistant Tertiary strata. The Marne is much the largest of these three streams, and its valley must have been deepened rapidly, while the other valleys must have been deepened slowly. As the valleys were deepened they progressively widened, but the widening must have been much more rapid on the weak than on the resistant strata; and the deep valley of the Marne must have widened in the weaker strata much more rapidly than the neighboring shallow valleys of the Soude-Surmelin and the Somme-Morin. Now the question arises, will the divides between these three valleys shift in such a manner as to alter the assumed original

*Not to be confused with the river Somme in northwestern France.

arrangement to the actual arrangement? Undoubtedly they would, and for the following reasons.

The valley of the Marne being deeper than that of the Soude-Surmelin, the divide between the two would be pushed away from the larger and toward the smaller streams, and eventually the upper course of the Soude-Surmelin would be diverted by a growing side branch of the Marne (the lower part of the Soude), and thus led to join that vigorous river, while the lower course of the Soude Surmelin (the Surmelin) would remain as a dimin-

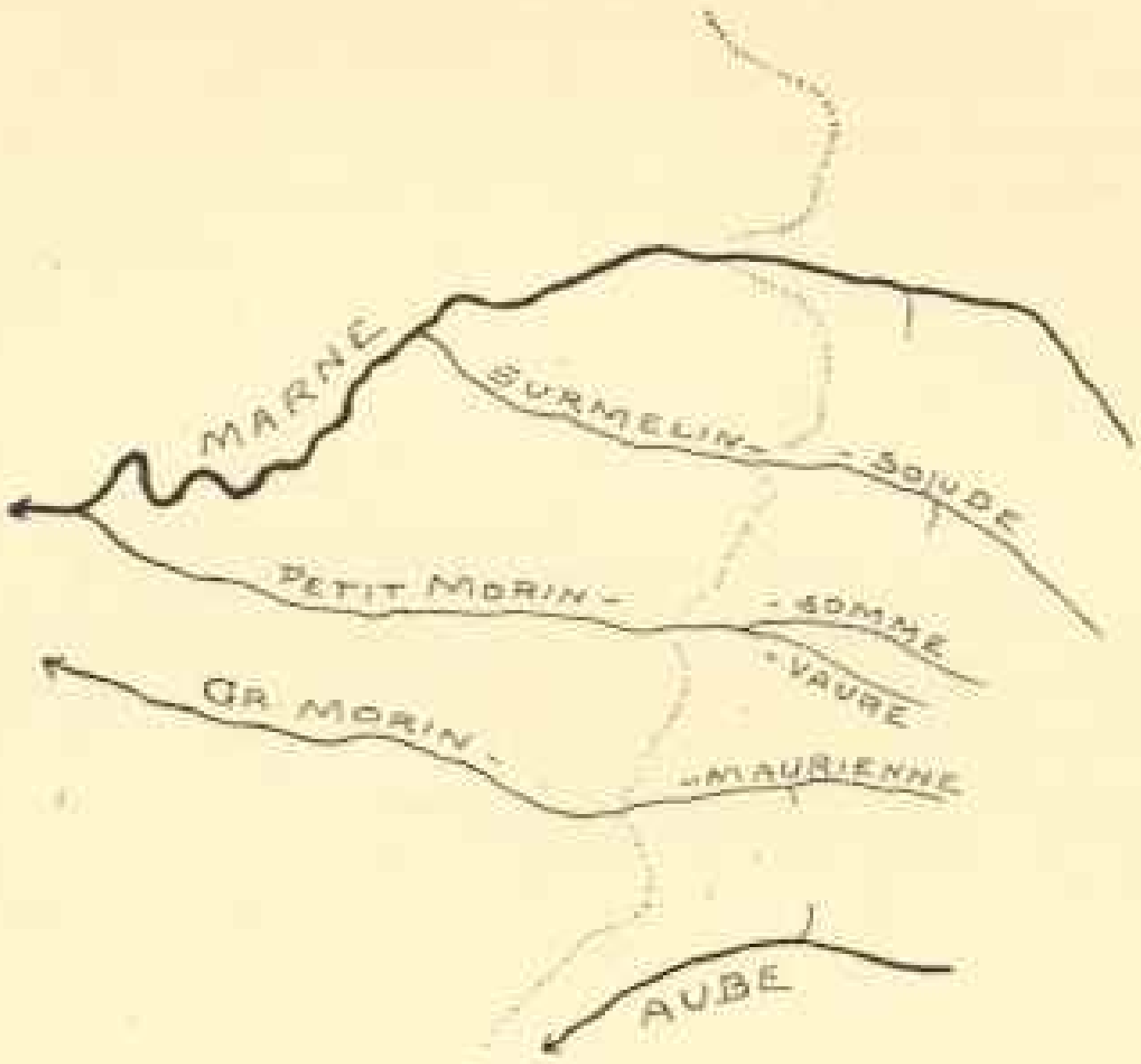


FIGURE 38.

ished, beheaded river. The side branch of the Marne, which causes the diversion, belongs to the class of streams called *subsequent*. Let us next look at the divide between the Soude-Surmelin and the Somme-Morin. At first, as these streams are of about equal volume, the divide between them would not be pushed significantly to one side or the other, but after the capture of the Soude by a branch of the Marne, the Soude would rapidly deepen its valley on the weak strata, and from that time forward the divide between the Soude and the Somme-Morin would be systematically pushed toward the latter. Eventually the upper waters of this stream would also be diverted to the Marne by the way

of the lower Soude, leaving the lower waters (the Petit Morin) as another diminished, beheaded stream; but inasmuch as this second capture must occur at a much later date than the first, it is natural to expect that the beheaded Petit Morin will, at the time of capture, have cut a much deeper valley through the upland than was cut by the earlier beheaded stream, the Surmelin.

The elbow of capture.—Let us call the sharp turn that the diverted headwaters make where they join the diverting stream "the elbow of capture." After the capture the rearranged watercourse will cut a sharply intrenched valley above and below this elbow, for the diverted stream, of considerable volume, being turned into the head of the diverting stream, where the volume is zero, must immediately deepen its channel. As time passes the trench will disappear by widening, and hence the occurrence of such a trench may be taken as indication of recent rearrangement. Similarly the diminished, beheaded stream may be more or less obstructed by the detritus that is washed into its valley by small lateral branches; thus its flow may be delayed by swamps or it may be even held back in shallow lakes, as the Inn is held back in the lakes of Engadine, as described by Heim; but this is also a relatively short-lived condition, for as time passes the beheaded stream will adjust its grade to the work that its diminished volume has to do and its lakes and swamps will disappear.

In nearly all cases further shortening is enforced upon the beheaded stream below the elbow of capture. It deepens its valley slowly, while the reinforced subsequent diverter deepens its valley with relative rapidity; hence the divide will be pushed away from the elbow of capture and the beheaded stream will be progressively diminished. The distance of the source of the beheaded stream from the elbow of capture may therefore be generally taken as a measure of the remoteness of the time when the capture took place. It not infrequently happens that a small stream is developed, flowing into the elbow of capture from the neighborhood of the source of the beheaded stream, and progressively lengthening as the divide is pushed away and the beheaded stream is shortened. Let us call streams of this class, flowing against the dip of the strata, *obsequent*. They will manifestly be wanting at elbows of recent capture, but they may attain a length of several miles if the capture occurred long enough ago.

Now, look at the actual arrangement of the streams on the lowland west of Châlons and on the upland beyond the escarpment,

while bearing these deductive criteria in mind. The Somme has lately been captured by the growth of a subsequent branch from near the elbow of the Soude; for, behold, at the little village of Ecury-le-Repos a sharp elbow in the course of this stream and a narrow trench for a moderate distance above and below the elbow. The Petit Morin is evidently the lower course of the Somme. On account of its diminished volume it is for the present unable to keep its valley clear of the detritus that is washed down from the steep valley sides in the upland, probably near Boissy and Le Thoult; hence the great marsh of St.

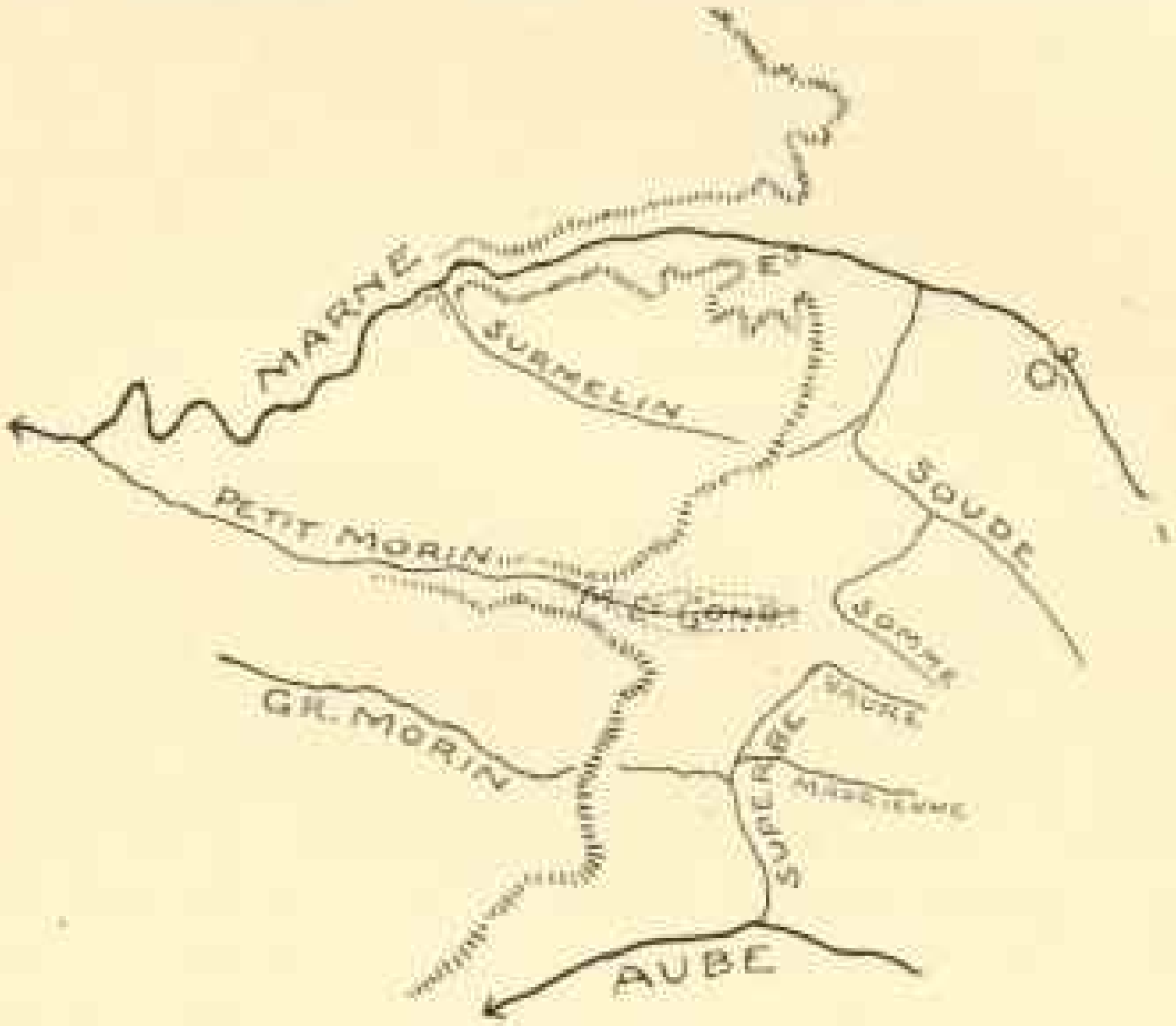


FIGURE 38.

Gond and its extensive deposits of peat about the head of the stream. The marshy head of the Petit Morin is still close to the elbow of capture at Ecury-le-Repos, and no obsequent stream is yet developed in this case. The change is clearly of recent date.

Look next at the Soude-Surmelin system. Here the capture occurred long ago; there is no sign of a gorge at the elbow of capture. An obsequent stream, the Berle, about four miles in length, has grown toward the retreating escarpment of the upland, and the head of the beheaded stream is now ten miles away from where it stood at the time when the capture had just taken place. Having lost its head rather early in the history of

the region, its valley through the upland is not cut to a great depth; it is much shallower than the valley of the Petit Morin, which was beheaded at a much later period, when it had become nearly as deep as that of the Marne itself.

It was while studying the French maps at home that I first came on this almost ideal example of migrating divides and adjustment of streams to structures, but it was not until an excursion abroad in 1894 that I was able to study it on the ground. I then had the gratification of confirming by direct observation, as far as the brief time at my disposal would allow, the expectations formed from study at a distance. The example of the Marne and its side branches therefore still serves me as a typical case of adjustments of this kind.

It is curious to note that another small stream, the upper Vaure, flows toward the marsh of St. Gond, but instead of being diverted northward by the Soude to the Marne, it is diverted southward by the Superbe, a subsequent branch of the Aube. It seems also probable that this subsequent branch has diverted the Maurienne at Pleurs, and thus cut it off from the Grand Morin, whose head is, like that of the Surmelin, on the upland west of the escarpment.

It is manifest that the terminology here employed will be of service in simplifying the description of other examples of shifting divides and river adjustment if they possess the same systematic features as are here so well exhibited. That such is the case I can confirm from the study of several examples near the escarpment of the Swabian Alp in Würtemberg, where the headwaters of the Neckar are actively pushing away the divide that separates them from the northern tributaries of the upper Danube. Although the arrangement of parts is not the same as in the example near Châlons, yet the homologies of the two regions can be clearly made out. The same may be said of the rivers of central England, which are as a rule well adjusted to the valleys between the uplands of the oölite and the chalk.

(To be continued.)

ACROSS THE GULF BY RAIL TO KEY WEST

By Jefferson B. Browne,

Collector of Customs of the Port of Key West

The traveler approaching Key West from the gulf of Mexico cannot but wonder that upward of twenty thousand people should have congregated on a spot so manifestly and completely isolated from the rest of the world. After landing and seeing how little man has done for the improvement of the island, or rather how nature has been marred by man's mistakes, the visitor's wonder changes to absolute amazement that so large a city could have grown up without railroad or even wagon-road connection with the state and country of which it politically forms a part. Unless, however, our visitor is an exceedingly superficial observer, he will soon begin to realize that it is not so much a matter of surprise that the city has attained its present growth as that, with the natural advantages it possesses, its development has not been still greater. He will learn that for fifty years Key West has held its supremacy as the most populous city of the state, and that it owes its prosperity not to any single industry, but to the diversity of its sources of revenue, the outgrowth mainly of its geographical location. Its fisheries, its sponge industry, its cigar manufactories, its importance as a coaling station and port of call for the commerce of the gulf, its superior advantages as a naval rendezvous and military station, all have contributed to the upbuilding of Key West on that broad foundation which is the secret of its continued prosperity. The shipbuilder, the sailor, and the sponger, the fisherman, the wrecker, and the stevedore, the cigarmaker and the machinist, the truck farmer and the fruit grower, all find employment in Key West and the adjacent islands, and no man with a technical knowledge of any branch of industry, with the single important exception of railroading, ever has to abandon his trade and seek a livelihood in another.

It is not too much to say that upon the completion of the Nicaragua canal, Key West will become the most important city in the South. Its harbor, land-locked by reefs and keys, in

which can float the largest ships of the United States Navy, has four entrances. The southwest passage has 33 feet of water on the bar, the main ship channel 30 feet, the southeast 22 feet, and the northwest 14 feet. A vessel leaving the harbor of Key West by the southwest passage would have to sail but 10 miles before she could shape her course for her port of destination, and through the main ship channel she would have only five miles to run before she was at sea. Ships putting into Key West for stores or repairs need go out of their course but 10 miles, an advantage possessed by no other port in the United States. The Government is now engaged in deepening the northwest passage to 21 feet, and when this is completed ships trading in the gulf will pass through the harbor of Key West, coming in at one of the main channels and passing out over the northwest bar, thus saving 70 miles and avoiding the dangerous reefs around the Tortugas islands.

That Key West will within a short time be connected with the mainland by a railroad, no one who has noted the trend of railroad building in Florida can doubt. The ultimate object of all railroad construction in this state is obviously to reach deep water at an extreme southern point, and Key West meets these requirements to the fullest degree.

The first survey of a railroad route to Key West was made by Civil Engineer J. C. Bailey for the International Ocean Telegraph Company as long ago as 1866. General W. F. Smith, better known as "Baldy" Smith, at that time president of the company, obtained from the Spanish Government an exclusive landing for a cable on the coast of Cuba for forty years. The company had under consideration two plans for reaching Key West with its telegraph system. One contemplated a land line to Punta Rassa, Florida, and thence by cable to Key West; the other a continuous land line along the keys. It was proposed to drive iron piles into the coral rock in the waters separating the keys, and to socket them about 10 feet above high-water mark with wooden poles, and Mr Bailey was employed to make the survey. While engaged in this work he surveyed the route for a railroad to Key West, and embodied in his report to the company his opinion of its feasibility and cheapness as compared with the popular idea of what such a road would cost. When the Western Union Telegraph Company obtained control of the International Ocean Telegraph Company this report came into its possession, and it is still on file in its offices in New York.

The distance from Key West to the point where a railroad would connect with the mainland is about 120 miles, 100 miles of which would be on the keys. The construction of a railroad from Key West to Bahia Honda, an island 30 miles from the former point, presents no difficult problems of engineering and would be comparatively inexpensive. When cleared of a few inches of vegetable mold and loose stones, the surface of the islands is as level and smooth as a ballroom floor. From Key West to Bahia Honda the railroad would traverse Boca Chica, Saddle Bunch, Sugar Loaf, Cudjoe, Summerland, Torch, and Big Pine Key. Between these islands short trestles, ranging from one hundred yards to half a mile in length, would be necessary; but some of the passages could be filled with the loose rock which is found in immense quantities on all the keys, thus obviating the necessity of trestling and making a solid roadbed. Not more than seven feet of water has to be crossed until Bahia Honda channel is reached. This channel lies between West Summerland Key and Bahia Honda, and has an average depth of about 20 feet, the distance across it being a little over a quarter of a mile. Here it would be necessary to have a drawbridge, as the channel is used by the small vessels cruising along the coast.

The most difficult and expensive portion of the road would be from Bahia Honda to Knights Key. Between these two islands the distance is about eight miles, but dotted along the route are several small keys, surrounded by shallow bars, which extend a half-mile or more on all sides. Molasses Key lies directly on the route from Bahia Honda to Knights Key. Between Molasses Key and Knights Key the water is deep and bold, and if the road was carried in a straight line throughout it would cross about half a mile of water varying from 20 feet to 25 feet in depth; but by making a slight detour to the northward and trestling from Molasses Key to Pigeon Key, and from Pigeon Key to Knights Key, deep water would be avoided. Between the former islands lies the Moser channel, named after Lieut. Comdr. Jeff. F. Moser, U. S. N., who located it during his Coast Survey work in this vicinity several years ago, and four miles distant and to the westward of Knights Key is the channel which bears its name; over one or both of these channels there would be another drawbridge.

After reaching Knights Key there would be very little trestling for a distance of 30 miles, until the small keys to the eastward of

Grassy Key were reached. Thence there would be two and one-half miles of trestling to Conch Key and the same extent to Long Key. After traversing Long Key for four miles the train would run over a trestle three and one-half miles long—the water varying from 10 to 12 feet deep—to Lower Matecumbe, a fertile island four miles in length. The next island is Upper Matecumbe, to reach which would require a trestle two miles long and a drawbridge over one of the three channels separating these two keys. The water between Lower and Upper Matecumbe, except in these channels, is very shallow, the banks at low tide being above the surface of the water. The channels are exceedingly narrow, but the depth of water in them ranges from 12 feet to 15 feet. Upper Matecumbe, Umbrella Key, Plantation Key, and Key Largo are separated by very narrow channels, not over 100 yards in width. The last-named island, the largest and most fertile of the entire chain, is 30 miles long, and connected on the north side with the mainland.

By a fortunate provision of nature there is situated about 30 miles from Key West a large island known as Big Pine Key, which is covered with a fine growth of pine suitable for railroad ties. All the islands over which the road would run are of coral formation. The piles used in the trestling and bridging would be of iron, which is easily driven into the soft coral rock. The lighthouses along the Florida reef are so constructed, and, standing on the edge of the gulf, exposed to the wind and sea, they have withstood the storms and cyclones of forty years. Over this road there would be no settling or washing of ties nor any sinking of trestles. Outside of the line of road and running parallel with it lies the Florida reef, forming a continuous breakwater from Fowey Rocks to Key West, and protecting the road from high seas even in the severest hurricanes. The channels between the reef and the keys are not over 12 feet deep, and the water in which the trestling would be built would be no rougher than that of any of our large rivers.

The keys are all below the frost line. The most delicate fruits and vegetables that were luxuriantly growing upon them during the two freezes of last winter were not affected in the slightest degree, and tomatoes, pineapples, eggplant, and tropical fruits were supplied from these islands after the fruit and vegetables in all other sections of the state had been destroyed. Owing to lack of transportation facilities, however, only a few of the keys are under cultivation; so the growth of the more delicate vegetables,

which must find a daily market, is limited to the local demand. With rapid transportation the Florida keys would supply the country with fresh vegetables all winter.

Key West is destined to become the Newport of the South. Not since the exceptional year 1886 has the temperature risen above 92° F. or fallen below 44°; in fact, the mean annual maximum of the last nine years has been only 90.4°, while the mean annual minimum has been 50.5°. In 1891 the minimum was 53°, in 1892 53°, and in 1893 52°. Soft breezes from the ocean blow continuously over the island. The sun shines for 365 days in the year and is never obscured for more than a few hours at a time, except occasionally in the months of September and October, when a West India cyclone is passing up the gulf. There are no malaria-breeding pools or streams, and sooner or later the thousands of tourists who are restlessly seeking a milder and more equable winter climate than the mainland affords will find in Key West their ideal health resort.

The products of the West Indies and Caribbean sea will be ferried across from Cuba in five hours and taken by the railroad for distribution to all parts of the United States. Capital seeking investment will reap no handsomer return than from a dry dock at Key West, into which would come for repairs the trading-vessels of the gulf which now have to go hundreds of miles out of their way to Newport News, and with the completion of the Nicaragua canal Key West would be a port of call for supplies and repairs for no small part of the shipping of the world.

A railroad to Key West will assuredly be built. While the fact that it has no exact counterpart among the great achievements of modern engineering may make it, like all other great enterprises, a subject for a time of incredulity and distrust, it presents, as has been shown, no difficulties that are insurmountable. It is, however, a magnificent enterprise and one the execution of which will call for the exercise of qualities of the very highest order. Who will be its Cyrus W. Field? The hopes of the people of Key West are centered in Henry M. Flagler, whose financial genius and public spirit have opened up to the tourist and health-seeker 300 miles of the beautiful east coast of the state. The building of a railroad to Key West would be a fitting consummation of Mr. Flagler's remarkable career, and his name would be handed down to posterity linked to one of the grandest achievements of modern times.

A GEOGRAPHICAL DESCRIPTION OF THE BRITISH ISLANDS

The April number of the London *Geographical Journal* contains an important account by Dr H. R. Mill of his plan for a comprehensive Geographical Description of the British Islands. He proposes that a memoir shall be prepared for each sheet of the Ordnance one-inch maps, giving an index of places; the mean elevation of the sheet and of the areas included between successive contour lines; a hypsographical description; a physiographical explanation; the areas of woodlands, moorlands, and cultivated lands; a description of local political boundaries and of historical events; and, finally and chiefly, a geographical chapter, "showing the relation of the human inhabitants to all the foregoing conditions, especially with regard to the sites of towns and villages, the distribution of population, the utilization of natural resources, and historical development of industries." A few carefully selected photographs of typical scenery should accompany each memoir. Some sketch maps and diagrams may also be included. A bibliography would give the titles of all pertinent publications.

This plan was favorably received at a meeting devoted to its presentation, and it is to be hoped that the Royal Geographical Society will vigorously promote so admirable an undertaking. Hitherto concerned chiefly with the exploration of foreign lands, a share of its attention may well be turned towards its home islands; for, as was truly remarked at the opening of a recent Italian Geographical Congress, however great the glory of distant exploration may be, the study of the home country is a geographical duty.

It may, however, be questioned whether the method of issuing a memoir for each survey sheet is on the whole advisable for a work in which the physiographical and geographical chapters, the most important parts of all, ought to be limited by natural and not by arbitrary geometrical boundaries. Unity of treatment would be gained and much repetition would be avoided by considering each physiographical area as a whole and not in accidental fragments as it happens to be divided by the edges of the

map sheets. The usefulness of the empirical measurement of altitudes on so detailed a scale as here proposed may also be questioned. Not contour-line areas, but physiographical areas, should be computed, for it is of little geographical value to include under a single arithmetical heading two surfaces of equal limiting altitudes, one a steep slope, the other a broad flat. Again, the seriousness of the undertaking is hardly recognized in the statement that "the physiographical explanation would, so far as the geology is concerned, be simply a restatement of the 'physical geography' section of the [local] geological survey memoir, with such modifications as the modern views of the cycle of development of a land surface suggest." This is as if one should say that a petrographical chapter in a new geological report should be merely a modification of a chapter on rocks that was written before the methods of modern petrography were invented.

It is stated that the geographical description "must be the work of a trained geographer, who, after studying the maps in the light of all the information referred to above, shall have made himself familiar with the ground." There are in Great Britain many travelers and explorers, but not many "trained geographers" in the sense contemplated by Dr Mill, and here seems to be a prime difficulty besetting this grand undertaking at its outset. But the difficulty may be in great part solved if to this crowning chapter we apply what Dr Mill says of a certain subordinate section: "It would be very suitable as an exercise and training for students if any institution existed in this country where students could be induced to study geography seriously." A work of this sort must necessarily be uneven in quality. It should exhibit a marked improvement from a fair beginning to a much better ending, and when the end comes a revision of the earlier parts may be fairly demanded. It is, therefore, to be hoped that Dr Mill will not adhere too closely to the philosophy that prohibits going into the water until after learning how to swim. Let a beginning of the work at least be made as a means of training up new geographers, and not merely as an occupation for geographers already trained. Let the Royal Geographical Society announce that it will publish in brochures chapters written according to an approved plan and reaching a standard satisfactory to a committee of editors. An actual beginning thus made, in the best form at present attainable, will give the strongest possible impulse to the serious study of geog-

raphy in the colleges and universities of a country where its neglect is now so much deplored.

To all parts of the work might be applied the remark introduced by Dr Mill under "historical information." It should be "very stringently edited, so as to confine it strictly to those features and events of direct geographical importance." The varied standards of articles in the current geographical journals indicate so vague an idea of the essential quality of geographical discipline that this stringent editing will surely be needed in every chapter of the proposed memoirs. Care must be taken that the volumes do not become so many encyclopedias of subjects that have not a "direct geographical importance." Local floras and faunas, for example, which stand in the list of suggested topics, might easily depart entirely from geography and become pure biology. Mere lists of species have practically no geographical bearing. If treated with relation to distribution they gain a touch of geographical quality; but if their distribution is used to reinforce the appreciation of conditions of form, altitude, soil, and climate they become as fully geographical as any other means of enlightened description. So with the study of population. Numerical tables extracted from census reports omit the essential quality of relationship that characterizes geography proper. True geographical study is needed to bring out the meaning of numbers and their dependence on physiographical conditions. We believe that Dr Mill appreciates these principles very fully, but there is a possibility that others who will probably coöperate with him are not so fully impressed by them, and that a committee of editors as a whole might not see the importance of excluding mere tabulations of species, of population, and similar unrelated records from the memoirs, unless the principle of relationship is insisted on from the beginning.

There is no place in the world that is today so favorably situated for the undertaking of a work of this kind as are the British Islands. Well defined by insular position, a compact embodiment of greatly varied forms, a seat of vast power and wealth, the rest of the world may hope to have the model of geographical monographs there established. There is, on the whole, no society in the world better fitted to encourage and support such an undertaking than the Royal Geographical Society of London—established in the world's center of commerce, the resort of great numbers of explorers, travelers, and others of geographic sym-

pathies, possessing vast resources in its library and its funds. Dr Mill, as a secretary of this society, is to be congratulated on the surroundings amid which his project takes form, and we wish him the greatest success in its execution.

W. M. Davis.

THE MEXICAN CENSUS

The population of Mexico, as ascertained by the census of October 20, 1895, is officially announced as 12,570,195. The population of the different states, with their respective capitals, is as follows:

STATES		CAPITAL CITIES	
Aguascalientes	103,645	Aguascalientes	31,619
Campeche	90,458	Campeche	16,631
Coahuila	235,638	Saltillo	19,654
Colima	55,677	Colima	19,305
Chiapas	313,678	Tuxtla Gutierrez	7,882
Chihuahua	286,831	Chihuahua	18,521
Durango	284,366	Durango	42,165
Guanajuato	1,047,238	Guanajuato	39,337
Guerrero	417,621	Chilpancingo	6,204
Hidalgo	548,039	Pachuca	52,189
Jalisco	1,107,863	Guadalajara	83,870
Mexico	838,737	Toluca	23,648
Michoacan	880,795	Morelia	32,287
Morelos	159,800	Cuernavaca	8,554
Nuevo Leon	309,607	Monterey	56,855
Oaxaca	882,529	Oaxaca	32,041
Puebla	979,723	Puebla	91,917
Queretaro	227,233	Queretaro	32,790
San Luis Potosi	570,814	San Luis Potosi	69,676
Sinaloa	256,414	Culiacan	14,205
Sonora	191,281	Hermosillo	8,376
Tabasco	134,794	San Juan Bautista	27,036
Tamaulipas	204,206	Ciudad Victoria	14,575
Tlaxcala	166,803	Tlaxcala	2,874
Veracruz	855,975	Jalapa	18,173
Yucatan	297,507	Merida	36,720
Zacatecas	452,720	Zacatecas	40,026
Federal District	484,698	Mexico	339,935
Territory of Tepic	144,308	Tepic	16,226
N. Dist. Lower Calif.	7,452	Ensenada de Todos Santos	1,259
S. Dist. Lower Calif.	34,835	La Paz	4,737

GEOGRAPHIC LITERATURE

Handbook of Arctic Discoveries. Columbian Knowledge Series. By A. W. Greely, Brigadier-General, United States Army; Chief Signal Officer. Pp. xi + 257, with 11 maps. Boston: Roberts Bros. 1896. $1.00.

This work is a perfect storehouse of arctic facts and figures, from the time of brave old Barents and Willoughby down to the present. As the title indicates, it is a "handbook" and not a narrative of arctic discovery; but the little volume "represents more than 50,000 pages of original narrative, from which the author has faithfully endeavored to compile such data of accomplished results as may subserve the inquiries of a busy man who often wishes to know what, when, and where, rather than how." Beginning with a chapter on the scope and value of arctic exploration, fifteen succinct chapters are devoted to a description of the north polar regions and of the successive explorations by which they have been made known; each of these chapters is followed by a special bibliography, while a general bibliography forms a final chapter, and the volume ends with an excellent index. The little book is a model of condensation and logical arrangement; it cannot be other than a godsend to the student of arctic literature; it shows immense reading and study with patience and perseverance beyond the average man; and its vivid and forceful style carries the writer back over years of arctic research and hundreds of volumes of arctic literature to his own voyages on icy seas.

G. W. Melville.

Crater Lake Special Map. Klamath County, Oregon. United States Geological Survey. Washington, 1896.

Rand, McNally & Co.'s Indexed County and Railroad Pocket Map and Shippers' Guide. Massachusetts, Pennsylvania, Kentucky, Washington, and other states; Quebec, British Columbia, and other provinces of Canada. New edition. Chicago: Rand, McNally & Co. 1896. 25 cents.

Occupations of the Negroes. By Henry Gannett, of the United States Geological Survey. Pp. 16, with 12 diagrams. Baltimore: The Trustees of the John F. Slater Fund. Occasional Papers. No. 6. 1895. 25 cents.

The Foreign Commerce and Navigation of the United States for the Year ending June 30, 1895. Prepared by the Chief of the Bureau of Statistics, Treasury Department. Washington, 1896. Pp. xcix + 1106 + 83, with diagrams.

Statistical Abstract of the United States. 1895. Eighteenth number. Prepared by the Bureau of Statistics, under the direction of the Secretary of the Treasury. Pp. xii + 412. Washington, 1896.

A commendable departure recently made by the Geological Survey is well exemplified in the case of the topographic sheet devoted to Crater lake, Oregon, which contains three very instructive as well as attractive illustrations, together with an interesting description of the lake and its

vicinity from the pen of Mr J. S. Diller, the accomplished geologist to whom the country is in no small measure indebted for its scientific knowledge of this great natural wonder.

The new edition of the Rand-McNally state pocket maps cannot fail to add to the well-deserved popularity they have so long enjoyed. The maps are clearer and handsomer than ever, and the geographical index by which they are accompanied is brought down to the date of publication, the population according to the state census of 1895 being substituted for that at the federal census of 1890 in all states in which an interdecennial census has been taken.

Nothing could be more admirable in its way than is Mr Gannett's presentation in the pamphlet recently published by the Trustees of the John F. Slater Fund of the facts brought to light by the Eleventh Census concerning the occupations of the negroes. The treatise is a model of lucid condensation, the brief compass of a dozen pages sufficing for a most satisfactory setting forth of the following important facts and conclusions, viz., that the negro is mainly engaged either in agriculture or personal service; that he has in a generation made little progress in manufactures, transportation, or trade; that males are in greater proportion engaged in agriculture and females in domestic service; that the negro has during this generation made good progress toward acquiring property, especially in the form of homes and farms, and that, in just so far as he has acquired possession of real estate, it is safe to say he has become more valuable as a citizen. The author's conclusion that the outlook for the Afro-American race is very favorable as agriculturists, but that there is little prospect that they will become an important factor in manufactures, transportation, or commerce seems to be fully warranted by the experience of the last thirty years.

With the possible exception of the Yearbook of the Department of Agriculture, of which 500,000 copies are printed annually, there is no publication of the United States Government that is consulted more frequently or for more important purposes than are the Annual Report on Commerce and Navigation, published by the Bureau of Statistics of the Treasury Department, and the Statistical Abstract, issued annually from the same office. These volumes contain the statistics of exports and imports, those of immigration and of the currency, and, for a large number of important commodities, those of total and per capita consumption and of market prices. They are continually being consulted and quoted by politicians of every party and economists and financiers of every school, and however conflicting the conclusions professedly drawn from them, the figures themselves are usually accepted without question. It is therefore much to be regretted that the value of the volumes for 1896 is so greatly impaired by the want of care with which the figures for the last fiscal year have been compiled. While many of the errors are not of sufficient magnitude to seriously affect totals or percentages, and are therefore of consequence only so far as they help to destroy the confidence of the reader in the contents of the volumes in general, this cannot be said of them all. In several cases they are of more or less far-reaching effect, while one by no means self-evident error of ten million dol-

lars plays havoc in all its relations. The efficient and respected Chief of the Bureau, who has in so many different ways added to the scope and value of these publications, makes a strong appeal to Congress for additional clerical assistance, the number of persons employed in the Bureau not having been increased during a period of nearly thirty years. Although the compilation of so enormous a mass of figures involves an amount of labor of which the average Congressman has not the slightest conception, it is not too much to hope that more adequate provision will hereafter be made for the work of this most important Bureau. The perfect indifference with which statistical inaccuracies are regarded is truly deplorable. Our legislators themselves are constant and serious offenders, numerical statements in the daily press are rarely to be relied upon, and even our most pretentious works of reference are not free from errors that are absolutely inexcusable. In the article on agriculture, for example, in one of our best known cyclopedias, an eminent college professor is responsible for the statement, among others equally erroneous, that the United States contains nearly a billion horses, or over fifty times the number it actually does or ever did contain. It is useless to take refuge in the plea of non-infallibility. No publication, whether official or non-official, can afford to make misstatements that are more than mere elusive, typographical errors.

J. Hyde.

PROCEEDINGS OF THE NATIONAL GEOGRAPHIC SOCIETY, SESSION 1895-'96

Special Meeting, March 27, 1896.—Vice-President Ogden in the chair. Hon. James H. Eckels, Comptroller of the Currency, addressed the Society on the Geographic History of Currency.

Special Meeting, March 30, 1896.—Fifth Monday afternoon lecture. Mr W J McGee in the chair. Prof. Harry Fielding Reid described and illustrated the Glaciers of Alaska, exhibiting many original views by means of the lantern.

Regular Meeting, April 3, 1896.—Vice-President Gannett in the chair. Mr Robert T. Hill read a paper on the Greer County Case.

Special Meeting, April 6, 1896.—Sixth Monday afternoon lecture. President Hubbard in the chair. The President announced that Prof. Wm. H. Dall, who was to have addressed the Society, was prevented from doing so by illness, and that Mr Marcus Baker had kindly consented to take his place. Mr Baker then described the voyage from Sitka westward to Attu island, with lantern-slide illustrations.

Special Meeting, April 10, 1896.—President Hubbard in the chair. Mr Wm. F. Mannix addressed the Society on Cuba as Seen by a War Correspondent, with lantern-slide illustrations.

Special Meeting, April 13, 1896.—Seventh Monday afternoon lecture. President Hubbard in the chair. Prof. I. C. Russell described his visit

to the interior of Alaska, up the Yukon and Porcupine rivers, and across the Chilcat pass to Lynn canal, illustrating his address by means of a large map and numerous lantern slides. The President announced that this was the last of the special afternoon course, and that the subject of the Lenten course of 1897 would probably be an illustrated tour across the Atlantic and through the Mediterranean.

Regular Meeting, April 17, 1896.—President Hubbard in the chair. Hon. Fred. T. Dubois, U. S. S., read a paper, illustrated by lantern slides, on the Geography, Scenery, and Resources of Idaho.

The following amendments to the by-laws were offered in writing, to come up for action at the annual meeting:

By Vice-President Greely: Article V, Dues. Add after second paragraph: "Suitable rebates may be made, in the discretion of the Board of Managers, in the annual dues of members elected in February, March, April, and May."

By Secretary Hayden: Add the following new article: "Article IX. Seal. The seal of the Society shall consist of a polyconic projection of the western hemisphere, from 0° to 180° west from Greenwich, with the legend 'National Geographic Society' above and 'Incorporated A. D. 1888' below, as in the design herewith."

Special Meeting, April 24, 1896.—Hon. Gardiner G. Hubbard, President of the Society, delivered the annual address from the chair, taking for his subject the Progress of Africa since 1888, with special Reference to South Africa and Abyssinia. The address was accompanied by lantern-slide illustrations.

Special Meeting, May 8, 1896.—President Hubbard in the chair. Mr George F. Kunz read a paper, with lantern-slide illustrations, on Geography as Illustrated by Precious Stones.

Regular Meeting, May 15, 1896.—Eighth Annual Meeting of the Society. President Hubbard in the chair. The Secretary and Treasurer presented their annual reports. Pending amendments to the by-laws were considered and adopted as follows:

Article V, Dues. Add, after second paragraph, "Suitable rebates may be made, in the discretion of the Board of Managers, in the annual dues of members elected in April and May."

Add the following new article:

"Article IX, Seal. The seal of the Society shall consist of a polyconic projection of the western hemisphere, from 0° to 180° west from Greenwich, with the legend 'National Geographic Society' above and 'Incorporated A. D. 1888' below, as in the design herewith."

Mr Wm. A. De Caindry and Col. H. C. Rizer were appointed a committee to audit the Society's accounts.

The President announced that, in accordance with the resolution adopted by the Society at a meeting held December 27, 1895, the Board of Managers had classified its members in three groups of six members each, as follows: To retire in May, 1896, Mr C. J. Bell, Hon. C. W. Dabney, Jr., Mr G. K. Gilbert, Mr H. G. Ogden, Hon. J. R. Procter, and Miss E. R. Seidmore; in May, 1897, Mr Marcus Baker, Mr H. F. Blount, Lieut. E. Hayden, Dr C. Hart Merriam, Prof. W. B. Powell, and Mr J. B.

Wight; in May, 1898, Mr Hy. Gannett, Gen. A. W. Greely, Hon. Gardiner G. Hubbard, Mr J. Hyde, Mr W J McGee, and Mr F. H. Newell.

The Society then elected the following-named gentlemen members of the Board of Managers for a term of three years: Mr C. J. Bell, Hon. C. W. Dabney, Jr., Prof. Wm. H. Dall, Dr David T. Day, Mr G. K. Gilbert, and Mr H. G. Ogden.

Special Meeting, May 16, 1896.—Eighth Annual Excursion and Field Meeting. About 300 members and guests went by special train to Charlottesville, Va., and there visited Monticello (the home of Jefferson) and the University of Virginia. The meeting was held at Monticello, President Hubbard in the chair, and addresses were made by Mayor Patton, of Charlottesville; President Randolph, of the University; General A. W. Greely, Dr Randolph McKim, Prof. W J McGee, Dr G. Brown Goode, and other gentlemen. After lunch the party visited the University and were received by the faculty, returning to Washington the same evening.

ELECTIONS.—New members have been elected as follows:

April 3.—Edward Bailey, Maj. Geo. V. Bontelle, Mrs L. A. Bradley, Henry G. Bryant, Dr John P. Davis, Mrs James M. Foster, S. L. Lupton, Frank C. Miles, Thos. C. Noyes, Dr Heinrich Ries, Geo. F. Thompson.

April 17.—Dr S. W. Beyer, Lieut. W. V. Bronaugh, U. S. N., Lewis Clephane, Maj. H. L. Cranford, Miss S. B. Hale, Geo. W. Holdrege, Maj. James M. Morgan, Alex. R. Mullowny, T. W. Neill, Gen. Albert Ordway, Horace L. Piper, Miss Elizabeth Wright, Henry Xander.

May 4.—W. L. Atkin, E. B. Baldwin, Hiram E. Deats, Dr Johnson Eliot, Miss E. F. Fisher, J. C. Gifford, Chas. Hallock, Rev. P. M. McTeague, Chas. A. Perkins, Chas. S. Prosser.

May 15.—James O. Brooks, Dr Wm. D. Cabell, Miss Ella Lorraine Dorsey, Gen. M. F. Force, W. F. Foster, Mrs H. D. Green, F. W. Perkins, Wm. E. Rogers, Lorin P. Smith, Hon. J. Randolph Tucker, W. A. Turk.

OBITUARY.—The Society has to deplore the deaths of three of its members—Mr Charles Addison Mann, Jr., who died March 12; Major William Holcomb Webster, the well known and much respected Chief Examiner of the Civil Service Commission, who expired suddenly on March 23; and Judge Victor C. Barringer, formerly and for many years a distinguished member of the International Court of Appeals at Alexandria, Egypt, whose death occurred May 27.

OFFICERS FOR 1896-'97.—At a meeting of the Board of Managers, held June 5, 1896, the following were elected officers of the Society for the ensuing year: President, Hon. Gardiner G. Hubbard; Vice-Presidents, Mr Marcus Baker, U. S. Geological Survey; Prof. Wm. H. Dall, Smithsonian Institution; Mr G. K. Gilbert, U. S. Geological Survey; Gen. A. W. Greely, U.S.A., Chief Signal Officer; Dr C. Hart Merriam, U. S. Department of Agriculture, and Mr Herbert G. Ogden; Treasurer, Mr C. J. Bell, President of the American Security and Trust Company; Recording Secretary, Lieut. Everett Hayden, U.S.N.; Corresponding Secretary, Mr Henry Gannett, U. S. Geological Survey.

GEOGRAPHIC NOTES

NORTH AMERICA

Newfoundland. The Newfoundland seal fishery has ended in a total catch of 196,485 seals, weighing 4,637 tons and of the value of $268,000.

Mexico. The imports of British cottons into Mexico in 1895 were nearly double those of the preceding year, although the Mexican mills were favored by protection and also by the low price of silver.

Canada. The Royal Society of Canada has adopted a memorial to the governor-general praying his intervention with the imperial government in favor of the unification of nautical, civil, and astronomical time, the reform to come into effect on the first day of the new century.

The Canadian and British governments have come to an agreement relative to the subsidization of a fast steamship service between Liverpool, or some other English port, and Quebec in summer, and Halifax, Nova Scotia, in winter. The vessels are to be in every respect equal to the best steamers running into New York.

SOUTH AMERICA

British Guiana. About 20 miles have been completed of the railroad that is being constructed from Kartabo point, at the junction of the Mazaruni and Cuyuny rivers and opposite the mining town of Bartica, to the interior of the country. Another enterprise that will facilitate access to the interior is the line that is being built from Wismar, on the Demerara river, to a point on the Esequibo above the dangerous falls that interfere with the navigation of that stream. Two other lines, both in the Barima mining district, are being rapidly pushed to completion.

EUROPE

Austria. Large vessels can now sail right up the Danube to Vienna, and the construction of ship canals connecting the Danube, Oder, and Vistula, and also between Budapest and Fiume, is strongly advocated.

England. The total receipts of the Manchester Ship Canal for the first four months of the present year showed an increase of more than $55,000 on those for the corresponding period of 1895.

The president of the Royal Geographical Society, Mr C. R. Markham, received the honor of knighthood on the recent anniversary of Queen Victoria's birthday.

The Founders' medal of the Royal Geographical Society has been awarded to Sir W. Macgregor for his valuable geographical work in New Guinea; the Patrons' medal to Mr St. George R. Littledale for his expeditions in Central Asia; the Murchison award to Khan Bahadur Yusuf Sharif, native Indian surveyor; the Gill memorial to Mr A. P. Low for explorations in Labrador; the Black grant to Mr J. Burr Tyrrell for his

expeditions to the Barren Grounds of northwest Canada, and the Cuthbert Peck grant to Mr Alfred Sharpe for his many journeys in British Central Africa.

France. According to the recent census, the population of Paris is now 2,511,953, an increase of 87,250 in five years.

The proposed ship canal between the bay of Biscay and the Mediterranean is pronounced impracticable as a private enterprise, and the commissioners farther report that it offers no such strategic or other advantages as would justify its construction by the government.

The activity and influence of the Société de Géographie de Paris are indicated by the fifteen medals and prizes just awarded as follows: 1. *Great Gold Medal*, Prince Henri d'Orléans, Exploration from gulf of Tonkin to gulf of Bengal; 2. *Gold Medal*, Captain G. Toutée, Explorations through Dahomey and on the Niger; 3. *Logerot Medal*, Commander Decoeur, The Niger Mission; 4. *Fournier Medal*, L. Rousselet, The New Dictionary of Universal Geography; 5. *Malte-Brun Medal*, E. Chantre, Ethnographical and archeological investigations in the Caucasus; 6. *Dewez Medal*, F.-J. Clozel, Explorations to the north of Upper Sangha; 7. *Herbet-Fournet Medal*, A. Pavie, Explorations in Indo-China and his efforts to extend the power of France in the far East; 8. *Bourbourand Medal*, L. Lapicque, Voyage in the Persian gulf and study of the Negritos; 9. *Duveyrier Medal*, Commander Decazes, Investigations of French Congo and surveys north of Abirus; 10. *Morat Medal*, J. Renaud and C. Rollet de L'Isle, Surveys in the Pai-tsi-long archipelago, Tonkin; 11. *Monthenot Medal*, R. de Saint Arroman, Study of geographic enterprises of the Minister of Public Instruction; 12. *Grad Medal*, A.-M. Gochet, Works on geographic instruction; 13. *Huber Medal*, F.-A. Forel, Work on lake Léman and on glaciers; 14. *Janssen Medal*, F. Foureau, Physical observations and explorations in the Sahara; 15. *Jomard prize*, H. Froidevaux, Memoirs of travel in French Guyanne.

Germany. The final report of the census of the German Empire, taken December 2, 1895, shows a total population of 52,244,303, an increase of nearly three millions within five years.

The traffic receipts of the North Sea and Baltic Ship Canal have so far been very disappointing. A traffic of 7,500,000 tons and receipts of nearly 5,000,000 marks per annum had been counted on, whereas the first eight months' receipts amounted to only 605,050 marks and represented a traffic of only 376,478 tons.

Italy. The population of Rome on December 31, 1895, is officially reported as 471,801, an increase of 35,621 since December 31, 1891. For some unexplained reason no enumeration was made of such of the inhabitants of the city as were without fixed abode, their number being assumed to be the same as at the census of 1891, viz., 28,765. The number having fixed abodes was 431,881 and the garrison 11,155.

ASIA

Siam. The French authorities at Chentaboun are making a road to Battambang and constructing a telegraph line.

UPPER BURMA. Active operations looking to the development of the mineral wealth of Upper Burma are about to be commenced. A promising gold reef has been discovered in the Wuntho district, and coal of excellent quality is reported from Lawksawk, in the Southern Shan country.

CHINA. An imperial edict directs the construction of a railway from Shanghai to Soochow, 65 miles, at an estimated cost of 2,000,000 taels. Shares for one-half the amount are offered to the public at Shanghai. Only Chinese stockholders will be admitted, and the government will retain control. The government has sanctioned a large increase in the production of salt as an additional source of revenue for the repayment of the Russian loan.

TURKESTAN. The Russian government is said to have decided to take another step toward getting within striking distance of Herat. A broad-gauge railway is to be built from Merv to a point near the Afghan frontier, a distance of about 130 miles, and all necessary material is to be collected at the far end of the line for the rapid extension of the road to Herat, a further distance of only 94 miles, in the event of war. Authority has also been given to the Turkestan administration to begin the building of a railroad along the Oxus from Charjui, where the river is bridged, to Kerki, within a short distance of the Afghan frontier.

AFRICA

WEST COAST. An amicable settlement of the boundaries between Senegal and Gambia has been arrived at by the French and English commissioners.

EAST COAST. In the British Colony of Natal there are more than 51,000 Indian laborers, and the Europeans are clamoring for the prohibition of further immigration.

PROFESSOR ELLIOT'S EXPEDITION. Consul Masterson reports that Prof. D. G. Elliot and Messrs Akeley and Dodson arrived at Aden April 14, where they procured 70 Somalis, 80 camels, and 20 horses and mules. A week later they crossed to Berbera, on the Somali coast. An absence of 10 months is planned, during which they will cross Somali into Gallaland and pass to the south of Juba river. The main object of the journey is the collection of mammals, but no effort will be spared to make the zoological collection varied and complete.

DR SMITH'S EXPEDITION. Interest is added to Elliot's journey by the very successful expedition of Dr A. Donaldson Smith, of Philadelphia, who left Berbera July 10, 1894, and visited the unexplored country of Gallaland, between Sheboli river and lake Rudolf. This lake, to the northeast of Victoria Nyanza, was reached in July, 1895. After a journey of 4,000 miles, Dr Smith arrived at Lamu, on the east coast, north of Zanzibar, on October 25, 1895, having lost only six men in sixteen months. His most interesting discovery was a race of pigmies, the Dume, very black, flat-nosed, large-lipped, woolly-haired, and averaging only five feet in height, the tallest being 5 feet 2 inches. The most valuable results of the expedition are the large and varied natural history collections, con-

sisting of 75 mammals; 300 specimens of plants, 24 new; 700 specimens and 400 varieties of birds, 24 new; 375 specimens of reptiles, 22 new, and 7,000 specimens of butterflies, 50 new.

POLAR REGIONS

The *Windward*, of the Jackson-Harmsworth expedition, will leave for the Arctic regions early this month. She will carry letters for Dr Nansen, on the chance of falling in with him north of Franz Josef Land.

Prof Y. Nielsen, of the University of Christiania, states that at the last moment Dr Nansen contemplated a change in his route. It was to follow the sea of Kara along the east coast of Nova Zembla and reach Franz Josef Land to the north of the 80th parallel, whence he would push to the north to seek polar currents. Nielsen believes that this course has been followed by Nansen, since he failed to call for the dogs and supplies collected for him at the mouth of the Olenek.

MISCELLANEA

Prof. R. S. Tarr will take a party of Cornell men to Greenland with Lieut. Peary this summer. The intention is to spend five or six weeks in studying the geology and natural history of a part of the coast north of Upernavik. The main object will be the study of glaciation, but the party will be so constituted that other subjects will receive full attention.

A Bronze Memorial Bust of Commodore G. W. Melville, Engineer-in-Chief of the United States Navy and Chief of the Bureau of Steam Engineering, has been presented to the Philadelphia Commandery of the Military Order of the Loyal Legion by a few of the friends and admirers of that distinguished engineer and arctic explorer. The bust, which is by Ellicott, is pronounced an excellent likeness.

Albert Perry Brigham has recently published a noteworthy article entitled "The New Geography" (*Popular Science Monthly*, April, 1898), in which some of the characteristics of scientific geography are appreciatively set forth. The geography of past generations related to earth-forms treated as changeless units; the geography of the present generation treats of earth-forms as landmarks in terrestrial evolution, and leads to the consideration of growth and decay, cause and effect, process and product, and finally of the agencies of earth-making; the old geography was mere description of dead forms, the new geographic description extends to history and cause. The contributions of Powell, Gilbert, Dutton, McGee, Davis, and other American students of the new science are recognized, Superintendent Powell's activity in disseminating sound method is commended, and the activity of the National Geographic Society in discovery and in inculcating modern ideas is noticed. The article is of interest as an indication of progress in the development and diffusion of scientific geography, and its appearance in a journal not given to the recognition of modern earth science is especially welcome.

The National Geographic Magazine,

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numbers among its contributors the following well-known writers on the different branches of geographic science:

Mr. Cyrus C. Adams, New York.
Dr. Cyrus Adler, Smithsonian Institution.
Mr. Marcus Baker, U. S. Geological Survey.
Capt. John R. Bartlett, U. S. N.
Dr. Francis Brown, Union Theol. Seminary.
Hon. Jefferson B. Browne, Collector of Customs at Key West.
Dr. E. L. Corthell, C. E., New York.
Dr. Elliott Coues.
Hon. William E. Curtis, ex-Director of the Bureau of the American Republics.
Mr. Frank Hamilton Cushing, Bureau of American Ethnology.
Dr. Charles W. Dabney, Jr., Assistant Secretary of Agriculture.
Dr. Wm. H. Dall, Smithsonian Institution.
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Mrs. Fannie B. Ward.
Mr. Bailey Willis, U. S. Geological Survey.

PRINCIPAL CONTENTS OF RECENT NUMBERS.

JANUARY.—Russia in Europe, with map, Hon. Gardiner G. Hubbard; The Arctic Cruise of the U. S. Revenue Cutter "Bear," with illustrations, Dr. Sheldon Jackson; The Scope and Value of Arctic Exploration, Gen. A. W. Greely, U. S. A.

FEBRUARY.—Venezuela: Her Government, People, and Boundary, with map and illustrations, William E. Curtis; The Panama Canal Route, with illustrations, Prof. Robert T. Hill; The Tehuantepec Ship Railway, with maps, E. L. Corthell, C. E., LL. D.; The Present State of the Nicaragua Canal, Gen. A. W. Greely; Explorations by the Bureau of American Ethnology, W J McGee. *Also map of the Orinoco valley, showing territory drained by that waterway and its bearing on the Venezuelan Boundary Question.*

MARCH.—The So-Called "Jeannette Relics," Prof. Wm. H. Dall; Nansen's Polar Expedition, Gen. A. W. Greely; The Submarine Cables of the World, Gustave Herrle; The Survey and Subdivision of Indian Territory, with map and illustration, Henry Gannett; "Free Burghs" in the United States, James H. Blodgett. *Also chart, 29 x 50 inches, showing Submarine Telegraph Cables of the World and Principal Land Lines. Full-page portraits of Dr. Nansen and Prof. Wm. H. Dall.*

APRIL.—Scriland, with map and illustration, W J McGee and Willard D. Johnson; The Olympic Country, with map, the late S. C. Gilman; The Discovery of Glacier Bay, Alaska, Eliza Ruhamah Scidmore; Hydrography in the United States, Frederick H. Newell; Recent Triangulation in the Cascades, S. S. Gannett; The Altitude of Mt. Adams, Washington, Edgar McClure.

MAY.—Africa since 1883, with special reference to South Africa and Abyssinia, with map, Hon. Gardiner G. Hubbard; Fundamental Geographic Relation of the Three Americas, with maps, Prof. Robert T. Hill; The Kansas River, Arthur P. Davis. *Also portrait of Hon. Gardiner G. Hubbard, President of the National Geographic Society.*

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AND THE CONCLUSION OF THE ARTICLE BY

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