



## NOTES ON MODERN GEOGRAPHY.

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IT must be a surprise to those persons who have not watched the recent developments of geography, but draw their opinions of its scope and character from the meagre treatises of bygone days, to observe how advanced is its present position among the liberal sciences, and how steadily on the increase is the recognition of its value in the eyes of the world at large.

If, indeed, we consider in turn the whole round of those scientific pursuits with which persons of thoughtful minds are glad to associate themselves in a more or less intimate connexion, we shall scarcely be able to point out any one of them that meets with a more general sympathy, or that rests on a sounder basis of popular support than that of geography. Thus, on applying the test that lies readiest at hand, of taking up the 'Transactions' of the several learned societies, and analysing the lists of their associates, we find none that can compare with the Geographical in the weight, eminence, and varied attainments of the persons whose names they contain. Nay, more, the following quotation may be received as evidence that Geographical Societies of other countries enjoy a reputation equal to that which they have earned in England. It is taken from an address delivered by the President of the French Society, shortly after its establishment in 1822, where he recounts with a natural satisfaction the progress it had already made, and expresses himself in the following terms: 'Our society contains men learned in every science, persons of intelligence from every country whose tastes and labours tend to the increase of geographical knowledge. There are astronomers, well-informed tourists who have travelled through distant lands, experienced navigators who have faced all the dangers of the sea, generals who have conducted war, highly-informed engineers, skilful geographers, naturalists, men learned in languages, statesmen, economists, and merchants.'

And it is reasonable to expect that such should be the case, since geography has every claim to be ranked as a thoroughly popular science. I mean, that the subjects on which it treats are of so remarkable a variety, that some of them, at least, must appeal to the tastes of every person; and, again, that its territory is not fenced off from the casual inquirer by too thorny a barrier of hard names and puzzling classifications, which compel him to follow a tedious path of dull study before it be possible to reach any free eminence or open spot, whence the nature of its beauties may be fairly seen and justly understood.

Few persons are willing to slave at the elements of a strange science for which they feel no natural taste, as even those whose minds are thoughtful and cultivated find little inducement to do so in the mere hope of their interest becoming so far engaged in their new studies as to tempt them on to a steadier course of inquiry. Creation is thronged with matters which solicit the attention of every earnest mind, and it is not to be expected that a science whose beauties are hidden and hard to get at, should enlist so great a show of popular sympathy as another whose objects are of no less interest, but whose stores are patent and accessible.

It is owing to these causes that geographers have enlisted a class of recruits, and most useful ones, too, from men who find themselves aliens to other sciences because, when circumstances might have permitted their doing so, they had never initiated themselves into their elements by preparatory studies. Of these are missionaries, emigrants, and officers on foreign service, who, feeling a vacancy and a want of intellectual occupation, which the duties and the society of their secluded homes are insufficient to relieve, are too ready to give up their moments of leisure in furthering any pursuit, if assured that their labours would be appreciated by the world as having a practical or a scientific value. Now, geography is always a field open to such persons, especially in the wilder countries; they have only to observe, and inquire, and record, and in proportion as they have attained to an accurate and common-sense knowledge of the place they live in,—its climate, its statistics, and its capabilities,—in that same degree will they be qualified to add a useful item to the great store of sound geographical literature, on the basis of which the wide generalizations of professed geographers can alone be built. And again, to men who have been urged abroad by a mere love of sport and adventure, when the keenness of desire is somewhat cloyed, and the long hours of travel become monotonous and wearying, geography is a legitimate and most absorbing source of occu-

pation. One question leads on to another, inquiries open out new matters of interest, and so great a variety of objects rise up on all sides which invite investigation and further progress, that a spirit and a life is infused into the undertaking able to carry it across many difficulties, where apathy would have succumbed to disaster.

The study of geography, from that high point of view from which alone it should be undertaken, is a peculiarly liberalising pursuit. It professes to reward those who follow it with the same expanded ideas that the best of travellers have gained for themselves by years of toil and slow accumulations. It links the scattered sciences together, and gives to each of them a meaning and a significance of which they are barren when they stand alone, and supplies a certain coherence to the scantiest fragments of information.

To the student of any science it affords means whereby he may learn to sketch in his imagination a truthful foreground and background to the special objects of his study; for it is the province of geography to supply those links which unite every object in Creation to the forms of nature which surround it—which are essential to its being understood aright, and in the keen appreciation of which, the great charm of natural science chiefly resides.

Can the reader, whether he be versed in zoology, botany, or geology, not call up to his mind many subjects of his favourite science to which geographical sketches, such as the following, would give both life and support? They are among the pictures that Tennyson hangs in his *Palace of Art*.

One showed an iron coast and angry waves :  
You seemed to hear them climb and fall,  
And roar, rock-thwarted, under bellowing caves  
Beneath the windy wall.

And one, a full-fed river, winding slow  
By herds upon an endless plain,  
The ragged rims of thunder brooding low,  
With shadow-streaks of rain.

And one a foreground, black with stones and slags,  
Beyond, a line of heights, and higher,  
All barred with long white cloud, the scornful crags,  
And highest, snow and fire,

But what *is* geography? To this we will reply as plainly as we can. In the first place, it treats of much more than latitudes, longitudes, territorial divisions, heights of mountains, and so forth. Its subject matter is more than a collection of

dry facts, of statistics of measurement, and topography, whose worth lies in their separate and individual value, and not in their mutual relations. It is more than a mass of records compiled and indexed in a gazetteer. All this is the raw material out of which geography has been developed into the position of a liberal science. Until very late years, much of the dignity of geography was believed to consist in its attempted approach to mathematical accuracy, and there still remain some persons who seem to think that dignity compromised if its teachings be made the vehicle of less precise knowledge than falls within the special province of the surveyor. Like the other physical sciences, geography is but of recent growth, and she has not long acquired the position in which she is now seated. Up to the present generation, it was not possible even for master minds to unite the scattered acquisitions of the several sciences into one comprehensive system, to show their mutual relations one to another, and to trace the harmonious way in which all the features of the earth are organized, and how every object has its appointed post in the one mighty scheme. But now, since the writings of Maltebrun, of Ritter, and of Humboldt, the case is very different.

Geographers of the modern school assert, with one voice, that there is much more within their legitimate reach than a mere collection of meagre facts about the earth's surface, and that, instead of such a collection being the goal of their labours, it is in fact but one part of the basis of their science. Far be it from geographers, as such, to grasp at more than what an ordinary mind can thoroughly embrace, and, still more so, to abandon scrupulous accuracy for the sake of vague and alluring generalities; but it is reasonable that students should endeavour to learn the earth and describe its features, not only as surveyors, but with the full light of whatever knowledge they may possess, whether, like Herodotus, it be in a plain, practical, common-sense way, or, like Humboldt, with the whole power of his stores of learning. A vast insight into a broad, but accurate knowledge of the world is within the scope of any man who is well grounded in the elements of the more important sciences; and though the more he may know of them the better, it never can be justly insisted that he should have attained to advanced proficiency before he can acquire a right to make that use of them which is indicated above. It is for special students in the several sciences to discover laws and natural classifications, which are thenceforward open to the geographer, as well as to any one else, to accept and make use of; but he is not expected to engage in the research through which these laws were

originally discovered, nor to load his memory with vast masses of uncriticised facts, whence new laws and principles are yet destined to be educes. Geography should borrow from all the sciences in order to link them together and to prevent their isolation, but she in no way professes to embrace and absorb them. Such a thing as a universal science may indeed exist, of which all special matters are only fragments and broken lights, but her domain is far above the humble flight of geographers. They do not soar as explorers towards the first simple laws of nature, that they may deduce from them a *rationale* of all her phenomena; they only profess to record these phenomena such as they exist in various combinations all over the globe, whether in obvious and instructive harmony, or in offering problems that remain to be solved, some by students in one science, some by those in another. They try to describe the world in its entirety, not superficially on the one hand, nor with infinite minuteness on the other, but with the bold, graphic, accurate strokes of a well-educated and observant artist.

By following a system of research and record on the configuration, climate, and products of every country, the inquirers of each age have so far added to the existing stores of information that their predecessors had bequeathed to them, and so great has been the more recent progress of geographical discovery throughout the world, that it has, at length, become feasible to systematize the science, and by uniting together unnumbered patches of information, to educe something like a consistent whole, and to shadow forth that which is really and truly geography—the form and complete features of the entire world. There are few isolated peculiarities now left to perplex the student; each fact is becoming grouped with its connexions, and begins to fall into its place among grand and regular series. The very winds and waves are ceasing to appear capricious, and acknowledge general laws. The physical features that geography has power to display form, indeed, a majestic picture. The wide blue ocean, heaved by tidal waves and running in a thousand currents; the vast continents, here crowding in snow-bound masses round the northern poles, there separating asunder in promontories that stretch their narrowing capes to the southward—these, with all their accidents of outline and surface, great bays, vast ridges, converging valleys that conduct the ceaseless outpourings of countless rivers, form but a framework that has to be clothed with the many-tinted dress of nature. It is a sketch that lies ready to be filled up with details, but yet in such a manner as neither to crowd it nor to give greater prominence

to one class of objects, in the treatment of them, than they actually possess in nature. For the geographer has to advance step after step until he has learnt the distribution of all the leading forms of organic matter over the surface of the globe, and recognised the harmonious order in which they exist with relation to one another and to the land itself they inhabit. He has next to examine the whole with relation to man, and to trace in broad outlines the effect of the geographical element upon the history and progress of his race. His task will have been well performed according as the ideas which he may have acquired for himself are truthful and of a just proportion to one another, rather than as they are brilliant or numerous.

It is with a deep persuasion of the claims of geography on the attention of all thoughtful persons, and in the belief that it is not alien to the character of an essay like this, to attempt to give some shape and body to the vague notion of that science which is entertained by too many of us, that the following pages are written. It is possible that they may point out matter of sufficient interest to take root in the thoughts of some casual reader, and prompt him on to further and to productive inquiry.

There are two distinct methods by which what is known about the earth may be kept on record; the one is by treatises, the other by maps, globes, and models; and to these a third may fairly be added, namely, the system of Geographical Societies; for these, besides serving as depositories for manuscripts, charts, and publications, are centres with which the majority of travelled men are in more or less intimate communication, and through means of which personal information on any particular subject can readily be obtained.

Geographical writings are very numerous, but we are only entering upon an age in which systematic treatises of any real comprehensiveness have become possible; for it is but of late years that our general knowledge of the world has even approached to accuracy and completeness. Questions of meteorology require that steady series of observations should be carried on simultaneously, at very many points, on the face of the world, before it be possible to decide them; and not only have we been without the necessary organization to accomplish this task, but half a century ago the instrumental machinery for doing it was for the most part uncontrived. Even until a few years back, although the ocean was ploughed by thousands of our ships, and every facility for observation thereby afforded, we had no adequate knowledge of the currents of wind in different parts of our globe. Yet, by learning their directions, navigators could have ensured at any time a great

diminution in the length of their average passages; and we know that each additional day spent in a voyage is a matter of tangible expense. It appeared to lookers-on that if there were one problem in physical science more obviously waiting to be solved, or more at hand to the inquirer than another, it was this. The objection of 'cui bono' was never urged by the owners or the captains of ships, as the solution of the question would have been a matter of immediate and calculable profit. Yet, such is the indolence of men, and so much more congenial is it to dream idly than to be up and working, that the vast opportunities of inquiry during numberless voyages had, till within most recent times, been left barren of result. The trade winds had been understood for more than a hundred years,—their regularity and that of the monsoons were absolutely depended upon; yet no general attempt was made to extend this partial knowledge of aerial currents to its widest extent, by making daily sets of observations on board every ship afloat that was manned by reliable officers, and combining the facts they had observed into one general system. This at length is partly done, and in a fair way of being completed; for which we are mainly indebted to Lieutenant Maury: and, if we measure our voyages by time and not by miles, the distances across the ocean are already docked of a very important fraction of their length.

These same remarks might, with little variation, be extended to the currents of the sea, which is no stagnant pool, whose surface only is lashed into breakers by the passing wind, or calmly heaves and subsides under the tidal attraction of the moon,—but a stirring scene of busy and incessant change, a complex system of regular currents and driftings that travel from Mexico to Spitzbergen, from Australia to the Cape, and on to Brazil, urging forward or retarding in their voyage the vessels that sail upon them. These have but very recently been explored in anything like the complete form in which they are now to be seen mapped out by Mr. Findlay, and turned to account by the navigator. We might greatly add to the list of subjects of which we are now only beginning to have a comprehensive knowledge, although it is impossible to overlook them in a geographical review of the globe, however sketchy that review may be: unless we are content to study geography in the barren and fragmentary form against which, at the beginning of this essay, we so strongly protested. The novelty of the science, and the vast extent of its subject matter, is the excuse why so few simple and comprehensive works on geography have yet appeared; and if, as we have shown, it was impossible a few years

back to draw up a general account of the great elementary features of the world, it may also be easily conceived that our knowledge has been far too little advanced to admit of encyclopædias being compiled, in which the geography of every country should be fully set forth, and in its main objects exhausted; but most excellent digests of what is known exist in Fullarton's *Gazetteer*, Blackie's *Gazetteer*, and Knight's *Cyclopædia*.

The province of maps is independent of that of treatises, for maps picture to us those countries in miniature on which it is the office of books to make comments and to generalize. Writing is a poor way of conveying topographical information; it is impossible that a string of descriptive fragments can ever convey the same perfect notion of a wide area that is attained to by throwing on it a single comprehensive glance. But books have a province of their own; and their usefulness would be little diminished to the geographer, even if he had a perfect map, or if his keenness of vision and the position of his study window could be made such as to command the whole world in a single view. Philosophy begins when the collection of isolated facts is sufficiently advanced; and the object of the map-maker is, by drawing the world in miniature, to supply, under an available form, one great part of that groundwork of facts upon which the science and the philosophy of geography is immediately based. But although when a country has been thoroughly surveyed and accurately mapped out, books have no occasion to meddle with mere description, yet in imperfectly known countries, the case is exceptional, and the very cause which makes books unable to convey such copious information as maps, gives them an advantage in recording that which is in itself fragmentary. Whatever is drawn upon a map becomes, from the nature of the case, invested with not only a local relation to every other object represented in it, but also with a size and a shape of its own, and acquires a definiteness which may be wholly unwarranted by the character of the statements to which the knowledge even of its existence is due. Take an instance:—we may have heard on excellent authority that in the heart of a certain country are two populous towns, separated by a range of bold hills, and yet be able to ascertain nothing more. Now this is a piece of geographical information well worthy of being recorded, as having value in itself, and as affording a means of developing some other chance gleam of information into more complete knowledge; but it is impossible to represent this, and no more than this, in a map. If the range of mountains be drawn at all, a certain geographical position must be

assigned to it; it must be drawn with a definite breadth, length, and direction, about all of which the map-maker is entirely ignorant; and the position of the towns must be put at guess, not only with reference to the rest of the map, but also to one another, and to the mountain range that separates them. If the district were thoroughly known, the map would show upon its face all those geographical relations which pages of laboured description would never exhaust; but being only partially understood, the draughtsman cannot follow the method of a narrator, and be simply silent upon those things of which he is in ignorance, but he is obliged to admit of great blanks in his work, and to consent to leave unrecorded a large part of that which he really knows. Therefore, in the first infancy of geography, maps play a less prominent part than in its more advanced stages; for in attempting to show a little they are obliged to assert too much; and if they endeavour to be explicit, they seriously mislead. Nay, more, the geographer may be, and usually is, in possession of many statements that are contradictory in important points, and these may be stated in treatises, but could never be recorded in a single map; for if it were attempted, the sheet would be scrawled over in endless confusion. A map must represent the conclusion at which the maker of it has, to the best of his judgment arrived, but it does not and cannot give the evidence on which that conclusion is founded.

In all map-making two distinct crafts are required: the one is to survey and draw the outline, the other to fill it up with whatever may give life to the picture—whether it be with conventional symbols, or colouring, or those half profile views of prominent landmarks that ancient geographers so much delighted in, and to which in these present days there seems a tendency to return. Now, of these two parts, the first is thoroughly scientific; and while it requires good instruments and mathematical proficiency to be undertaken at all, it can be followed with certain success by any qualified person who chooses to engage in the labour. The other is of a totally different character; it is purely an art and not a science; it requires a union of artistic skill with great ingenuity, and there seems no assignable limit to the success it may hereafter achieve. These two branches stand to each other in somewhat the same kind of relationship that perspective does to drawing. The one being a matter of dry, accurate, and laborious science, which is the better for being kept in the background, but which can never be disregarded; while the other is a life-like portraiture, the production of which is the end and object of the whole undertaking. It is in this last branch that the great

majority of map-makers up to the present time, are so remarkably unsuccessful. There is quite sufficient accuracy of outline, for general purposes, in the maps of the civilized world; but with very rare exceptions do these maps attempt to present a picture like that which meets a traveller's eye when standing on a commanding mountain peak in a clear day. But before pursuing this question further, it will be well to consider awhile the work that lies before the geographer, for we shall be less tempted to exact too much the more clearly we perceive how vast it is.

The great features of physical geography can be recorded on a map of a very small size in itself, and quite infinitesimal with regard to that of the huge sphere it portrays. On a small sheet of paper there is room to indicate every navigable river, every spacious harbour, every great mountain chain. Lines of equal temperature may be drawn, the zones in which different groups of animal and vegetable life flourish may be sketched out, and room may be found for describing with a bold and accurate touch all other matters of a similar description, such as we find already done for us in the well-known atlases of physical geography; but when we desire to make ourselves acquainted with a particular country, and wish to learn its localities and home features, a map on a far larger scale becomes requisite, and it is a matter of some interest to determine what that scale should really be. Every geographer professes to look forward to a time—a far distant one—in which we shall be in possession of a so-called accurate map or model of the entire earth. But what is meant by the word *accurate*?—into what degree of detail should a reasonably perfect map be expected to enter? In fine, what should be the scale upon which it ought to be constructed? It were absurd, on the one hand, to desire that every bush and every ditch should be marked down, and on the other hand we assuredly want more than a mere indication of each woodland and each navigable river; but these are wide extremes, and where between them does that mean lie which is to be the goal of our endeavours? The principle may perhaps be accepted as follows:—that every feature which influences aspect, shelter, or means of communication should have a place on the map, that the scale should be of such a size as, generally speaking, to include every object whose magnitude and importance is sufficient to secure permanence, and to have earned for it a definite place in the recollection of its neighbours, or, what answers pretty nearly to so vague a definition, every place or thing large enough to deserve a name. The scale should therefore be sufficiently ample to include brooks, crags, and

clumps of trees. Smaller isolated objects may easily enough be represented by a dot, should they happen to be placed in a conspicuous position, and from that cause to attain importance as a landmark, which from their mere size they would not have merited. Now, as a traveller proceeds on his road, and studies the country that spreads wide away on either side, he will obtain a very accurate knowledge of all that lies within two miles of him, when the day is clear and the light such as to throw the undulations of the ground into relief. At that distance, even the minute details of the rigging of a ship will stand out clear against the sky; objects three feet across, such as distant chimneys, cease to be mere lines, and have a sensible breadth; the very trunks and boughs of trees may be visible, and their foliage seen to retain much of an individual character. Now, if the landscape, viewed at a distance of two miles, be drawn exactly as it would appear if projected upon a sheet of paper held ten inches from the eye, (which may be assumed as the distance at which a student would pore over his map), it follows as a necessary consequence that the scale of that projection would be as ten inches to two miles.

It is considered in practice that a delicately executed map of the scale of one inch to a mile, such as our ordnance surveys of England, is quite large enough to include that amount of detail which was claimed a few lines back\* as essential to a good map of any locality which we wish to study for general purposes. Five times that size was shown to be large enough for making a perfect picture as well as a map. Furnished with these data, let us consider what is the amount of work which has to be accomplished before geographers can become possessed of a map of the whole world, even on the first-mentioned scale. The superficies of the dry land on the globe is about fifty millions of square miles, and consequently the space over which it would have to be drawn would cover fifty million square inches of map, or a square area of five hundred feet in the side, which is a space larger than Portman-square; and a globe representing the earth, built on this same scale, would be more than two hundred yards in diameter. By dwelling awhile upon these considerations, and conceiving these acres of surface, scrawled over with countless lines and touches, each of which requires to be accurately placed to less than the breadth of a needle, we shall gain some idea of the immense variety of hill and dale, and variously configured surface on the broad expanse of this great world of which the geographer has to take cognizance, and with which he is now successfully grappling,—each tiny group of which in habitable regions no larger than a wafer on the surface of the map, is capable of

forming a home neighbourhood, with, it may be, its garden, its clump of trees, its neighbouring hillock and brook; within whose narrow bounds whole families may live and die; with which all their associations of boyish days and manhood may be bound up, and in which they may read ample proofs of the presence and goodness of God in the harmony of His countless works that throng even that insignificant fraction of the earth.

The labour that is expended in accurately mapping a large tract of country is enormous. It is proverbially 'a work of ages and of nations;' for not only does it require means far beyond those at the command of a single individual, but it literally seems to take up a longer time to complete than is within the compass of a single life. We have experience of a generation passing by before the observations were made, calculated, and tested, the details filled up, the whole engraved upon plates, and the results issued to the public: for our own ordnance maps have dragged their tedious course along for more than half a century; they were begun in 1796, and a large part of them are still unissued.

The greater part of the surveyor's trouble consists in determining the position of the principal points with scrupulous nicety, for everything depends upon their accuracy. They are cardinal positions, and an error in any one of them is liable to run through the whole map, and lead to contradictions and uncertainties in some distant part of it. Hence, months of labour may be wasted if one of these proves to be incorrect; but if, on the other hand, these alone are perfectly right, and if the details of any district should have been erroneously mapped, it may be resurveyed, and the new plan will be found to fit accurately into the place of the old one. Once done, they are done for ever; but if carelessly laid down, the foundation of the map is irregular, and the whole superstructure becomes distorted and strained awry. The consequence is, that large instruments and long series of observations are brought to bear on their determination, and the work must continue until the positions assigned to them are found to agree sufficiently well with the result of more than one set of measurements and triangulation, and also with their latitudes and longitudes as learnt from the stars. Now, except in parts of Europe and North America, India and the Cape, this has never been done, and perhaps two-thirds of the globe is unmapped, with even a distant and approximative degree of accuracy, while the vast areas of Central Africa and Australia are entirely matters of guess-work.

In childhood we have perfect trust in all that our seniors

tell us; as boys, we consider all that is in print as infallible; and up to much later years do we put an equal and undoubted faith in our maps. But this, too, is doomed to perish utterly on the first shock of experience. There is usually as great a difference in geographical value between an ordnance map and, it may be, a beautifully engraved, popular one, as there is in poetical merit between a copy of Shakspeare and a gorgeously-bound volume of the vilest trash that was ever published by aid of titled interest and half-extorted subscriptions.

It would be quite foreign to the objects of an essay like this to enter at any length into the methods by which surveys of the highest order of accuracy are carried on, but it may be observed that while common triangulating and ordinary star observations, such as travellers depend upon, are very simple matters in theory, accurate surveying calls forth all the resources and the refinements of high mathematics, and is therefore comparatively rare. A good sextant, and a practised observer can, without much difficulty, find his latitude to nine or ten seconds, that is to say, to three hundred yards; the best instruments and most skilled observers will give the latitude to about one second, or thirty-three yards. Between these two classes of work there is all the difference in the world; the first can be managed by the rules of plane trigonometry, or without trigonometry at all, by simply protracting the angles upon the map, and marking the points of intersection made by the lines which form them; but in the second case, where the greatest possible accuracy is aimed at, a huge coil of difficulties is introduced. In the first place, the whole matter is taken out of the domain of plane mathematics, and put into the cumbrous formula of spherical trigonometry, because in accurate work, the globular form of the earth becomes far too sensible in its effects on the results to be disregarded in the calculations. Again, the instrument itself is mistrusted, and allowances have to be made for the errors of its workmanship, which must be found out by artfully contrasted observations, of such a character as to eliminate or define them. And finally, the varying effect of refraction affords a serious difficulty;—in fact, the matter becomes an exceedingly troublesome problem.

It may seem scarcely credible to some persons that, huge as is this earth, three hundred paces should take us so far round its shoulder (if such an expression be permitted) as to make a perceptible difference in the appearance of the heavens when measured by a small hand-instrument sufficiently light and simple for a traveller to take with him in the rudest

expedition; yet such is the case, and no traveller should be unacquainted with its use. The moon and sun are each of them, in round numbers, thirty minutes of a degree in diameter, and therefore, if a person started from his home and travelled thirty geographical miles (about thirty-five English miles) southwards, he would find the polar star to have sunk through a space equal to the breadth of the moon; and the sun, at midday, to have risen in the heavens through a space equal to its own diameter. The entire vault of the sky would appear to have shifted to that extent. New stars would have come into sight in the south, old ones would have sunk below the horizon to the north. This is, indeed, a palpable difference, which the rudest of contrivances would make evident; for the length of the shadow of an obelisk, or that of a stick planted upright in the ground, would be perceptibly altered. The experiment may be made in what is really a practicable way of finding rough latitudes; namely, by suspending a knotted string with a stone at its end, and letting it dip in a puddle of water, both to check its oscillations and to ensure a level surface, whereon the length of the shadow between the two knots can easily be measured. Now, that a hand-instrument should be capable of dividing the apparent diameter of the moon into about thirty parts is nothing very remarkable; and that the power of the telescope and lens, added to the marvellous workmanship of the present day, should divide it six-fold more minutely, or to spaces of ten seconds, which is a little more than three hundred yards, is easily credible.

It may be added that the sextant, which is everything to the sailor, is scarcely less important to the traveller by land; its thorough efficacy in every way, its simplicity, lightness, and strength, make it a most worthy bequest for the great Newton to have transmitted to us,—for to him, next after Hooke, and not to Hadley, we are said to be indebted for its invention. By its means a traveller can always, by a little painstaking, in a clear night or day, determine his latitude, as has been already mentioned, to three hundred, or very easily indeed to six hundred yards. An explorer has no legitimate excuse but laziness who does not take frequent latitudes. In the northern hemisphere, he has always the pole-star to rely on, and can find a good latitude by little more than a simple observation of it whenever it is visible; but it is certainly a pale, faint star, and has no representative in the southern hemisphere. It is indeed a matter of trouble to a tired traveller, who is dead beat with fatigue and can hardly keep his eyes from closing, that the bright stars are scattered about the sky in so inconvenient a manner for the purposes of observation. Hours

will elapse at some seasons of the year, in every latitude, before he can make use of any one of them; at other times there are more than he cares to have. He may almost be excused for wishing that he could have the heavens formed to suit his purposes, by making the north star blaze out as bright as Sirius, and placing a corresponding one in the southern hemisphere. What infinite convenience to navigators and explorers would such a phenomenon afford! However, the determination of latitudes is comparatively easy, but that of longitudes is a far more troublesome business, and the difficulty of obtaining them is still a serious evil. Those that depend on lunar distances and altitudes, which are the only methods that can be employed on every night (with the exception of chronometrical methods, which are unfitted to rude travel), are, as near as may be, thirty times less accurate in their results than those of latitude; and not only that, but in practice it takes a vast deal more labour and work in observing them, and at least thirty-fold the trouble in calculating them. A single latitude occupies some ten minutes in arranging instruments and in observing, and two minutes in the whole process of turning over leaves of nautical books and working out, and it tells to six hundred yards; but three sets of five lunars each take a single person an hour or more to observe, two or three hours to work out, and after all can barely be depended upon, without further check, to ten miles. A traveller who has had the good fortune to be advised to take a powerful telescope with him, and a clip to hold it, so made as to screw into a tree or log of wood, has a great advantage. He can select occasions for observing eclipses of Jupiter's satellites, which will tell his place to eight or ten miles, with a minimum of calculation; and frequent opportunities will arise of observing occultations of small stars; these can be worked out at leisure, and will yield the most satisfactory of all results, even to one or two miles: but a really good telescope is required for this kind of work, and a much better and larger one than tourists or sailors are usually provided with. A running survey of a new country is best made by triangulating as much as is practicable, especially with the aid of an azimuth compass, by taking latitudes every night, and by accumulating masses of longitude observations upon a few important points, by the result of which the whole of the rest of the map is, as regards its breadth, adjusted. In this way a newly-mapped country has its position definitely fixed with regard to all the rest of the world, and further discoveries, though they may complete what was hastily done, or give higher accuracy to what was confessedly approximative, can never entirely overturn it.

The advantage gained by star determinations is very great, especially in the earlier stages of geography; the whole that a man can see with his own eyes, of the country he visits, is a narrow belt, usually three or four miles broad, on each side of the route by which he traverses it. If he comes to a river, he can only say that it was of such a breadth and volume where he crossed it, and that it flowed in such and such directions; the rest must all be by hearsay. If, however, the route of another traveller at any future period passes near his own, and if both have been able to ascertain, by astronomical observations and other means, the precise part of the country over which they severally were journeying, it is obvious that the two routes, taken in connexion, will be a mutual check and explanation to one another, and determine, with more or less accuracy, the nature of the intervening strip of land. It is thus that ridges are first traced, lines of watershed drawn out, boundaries of every kind determined, and so forth; but, without positive determinations, all these matters are vague and uncertain.

The difficulty of compiling a true map from hearsay is a consequence of this uncertainty, but no one can thoroughly realise it who has not attempted it. We flatter ourselves on our intelligence, compared to that of nine-tenths of the inhabitants of the earth; but let the reader attempt to draw a map of any part of the world he has travelled over, any fields and cross country roads that he has lived amongst, and of which he can recal to his mind no formal survey or published map. He will soon find how utterly vague and contradictory his ideas are—he will not even know the direction of the north and south line, within some three or four points of the compass. Now, if an educated European's knowledge is of this inaccurate nature, what must that of a savage be, the horizon of whose mind is far too narrow to comprehend a broad area in a single thought? and still more, how great must be the difficulty of patching together a mosaic-work of the distorted fragments which savages may contribute, into anything approaching to the shape under which the entire country exists in reality? Columbus was induced to sail westwards from Spain as a short cut to India owing to the monstrous distortion of the known parts of the globe, which were mapped out by the German geographers from the *Itineraries* of Marco Polo. He had travelled so many miles to the eastward—the circumference of the world was much less than twice that,—therefore he had gone much more than half round the world,—and therefore the shortest way to his farthest point was by starting in the opposite direction to what he did. The col-

lary to this is, that every traveller who visits imperfectly-known countries, if he hopes to avoid being mischievous, and to afford the world any definite knowledge about what he has seen, should prepare and practise himself in taking astronomical observations, even though they be of the simplest kind.

It has already been remarked that the science of map-making, as regards the production of pictorial maps, is in its infancy; there being very few cases indeed in which the aspect of a country is at all pictured to the eye that studies it by means of its maps. The coloured bird's-eye views of the Crimea and Baltic that now adorn the windows of every stationer's shop, both indicate the want that is felt for this kind of representation, and also the low degree of success with which modern art has bestirred itself to supply that want.

Yet, poorly drawn as these maps are, to how great an advance in the clearness of our conception of the geography of the world should we have attained, if the whole of the countries that have been mapped at all were also portrayed and coloured with as skilful an execution as Stanford's map of the Crimea.

The principle on which these maps may be projected is extremely simple, and for general purposes it is quite easy to estimate distances by measurements on the face of any one of them. Conceive, for instance, a raised and painted model of a country, moulded on a flat surface, according to any one of the recognised rules of projection, with all its features and colourings accurately rendered, or, where advisable, conventionally exaggerated. Placing this on the floor, at a certain distance, that very bird's-eye view is obtained which it is our present object to draw. Now, imagine a sheet of paper to be laid by its side, and on it, seen equally from a bird's-eye view as is the model itself, conceive a painting to be made so that when viewed from the position in question, the map is a *fac simile* of the model. This is one way, and the simplest one, of making a pictorial map; the next is to project this very map, or, it may be, the model itself, upon a piece of paper held between the eye and it. In fact, to draw upon a map that is intended to be viewed by a person standing directly opposite to it the picture that was presented to the eye when it viewed the first map in perspective.

Of course, a single bird's-eye view of a country is unable to display all its features. No picture can do more than give one side of a solid object; it is only by studying pictures from different points of view (which is the exact equivalent to our looking about us as we travel, or our examining a model on every side), that a perfect knowledge of any tract of ground

can be obtained; thus, looking from the English Channel, the precipices and crags of the Dover line of cliffs will be in face, but, looking from the north, the sloping downs that form their backs can alone be seen. It is impossible to be otherwise. There is no commanding royal road or point of sight so eminently placed that the opposite sides of a given object can be seen at one and the same time from it. The difficulty lies in the very nature of things; and if a pictorial sketch is insufficient to show the country exactly as it is at a single glance, it is not a fault special to that particular method, but is shared in by every other means of representation. The only way is to multiply our pictures, and to represent every country from two or three points of sight, then, by comparing the results, a learner may master the features of the ground, but it is impossible for him to do it in any other way. It is much to be wished that these picture-maps and bird's-eye views were multiplied; and that every traveller would make it a point to compile general views of the country he has travelled over, colouring his outlines with scrupulous exactness, according to its most characteristic tints. It has been already remarked, that where the map is on a small scale there must be occasional exaggeration, or else the characteristic features of every country would dwindle down into so small a size as quite to lose their individuality; but this is purely conventional. The dozen or two little trees that a map-maker engraves on his plate to indicate the localities of an extensive woodland, are not supposed by anybody to be in proportion to the actual size of the trees themselves; nor are the tufts of rushes and the short wavy lines that represent so graphically the tracts that lie waste in marshes, presumed to be faithful reductions to the scale of the rest of the map of the identical sedges and ripples of water, of which they are the well-understood symbols. A common sense is sufficient to show what objects are faithful representations according to scale, and what are exaggerations of one hundredfold or more;—no error need be introduced from that cause.

The maps that appear to be most wanted by geographers, in addition and not to the exclusion of those now in use, need not be of a large scale, but they ought to show the characteristic features even of the vegetation, *at least* so far as to distinguish forests of pine, oak, and palms from one another, and to represent the difference of an equatorial jungle and an English bed of sedges. There is room for the display of a vast deal of art in these; and until the attention of geographers, who are themselves artists, have been drawn to the matter, it is really impossible to tell what are

the capabilities of such maps, especially when they are constructed on a small scale; but, judging from the success with which the various kinds of rock and certain other geographical features have already been represented, as in the maps of M. Ziegler, we have reason to expect that future artists may be more widely successful, and by seizing upon the characteristic markings of the earth's face, succeed in portraying them with a few graphic etchings and touches, which less skilful originators may be able afterwards to imitate and form into a system.

It is hardly to be expected that travellers should always find it advisable to draw up for publication large pictorial charts of the routes they have travelled, but duplicates of their sketches and surveys would be a very valuable acquisition to the records of Geographical Societies, where they could be studied by map-makers who wished to compile a pictorial chart of the country in which they lay. It would, I should think, be a very interesting task to endeavour to map a district on this method, and the result would be sure to be a gratifying one, if the traveller had the eye and the touch of an artist. The strictly accurate, but meagre information that is afforded to a student by ordinary maps is more tantalising than satisfactory. A blind man fingering a model could learn as much from his sense of touch alone, as they can convey to our eyes. They are little more than an abstraction, or a ghost of the vivid recollections with which the memory of a traveller is stored; not that these recollections are very varied or shifting—one image succeeding another in rapid changes, but that the somewhat stereotyped survey which the mind recalls when it attempts to image to itself the features of a once-visited country, is a matter of colour and blaze of sunshine, and dancing waters and quaint crags or well-marked headlands, and here and there stretches of level land clothed with russet forests or lying open in tawny plains. It is surely not too much to expect that at least some allusion to these features—which are everything to the memory, which are precisely what every traveller whom we address is mentally referring to as *his* map, whilst he answers our questions, —should find a legitimate place even in the highest and driest system of topography.

I cannot resist pursuing this matter further, and remarking how much more is bound up in the recollections of a country than books or maps can ever convey to a stranger, inasmuch as the perceptions of other senses besides those of sight enter very powerfully into them:—for instance, that of the smell which is peculiar to every country and pervades the entire

land. Though usually forgotten by the resident who lives and breathes in its atmosphere, it nevertheless forms part of his everyday feelings, and it is by its absence or change, as much as by any other single cause, that a man realises to himself that he has changed his country, and emigrated to a foreign land. In the recently published volumes of M. Huc, on China, allusion is made to this matter with great truthfulness, as all who have travelled widely, and had opportunities of perceiving marked differences, must at once recognise. He and his companion, after long travel on the bleak high lands of Thibet, journey homeward, and when descending into the low plains of China at their foot, the peculiar warm fragrance of the 'Flowery Empire' suddenly strikes them, and brings vividly to their conception the fact of their change of country, and pours upon their minds a whole flood of Chinese recollections and old associations. I have little doubt that every reader will be able to supply many other instances from his own experience, where the sense of smell plays an important part in his perceptions of any particular town or country. Thus that of the seaweed, the fish, and the tar of a village on the coast, the peat-smoke smell of the Highlands, or the gross, coarse, and fetid atmosphere of an English town. France, Switzerland, Germany, and almost every European country, has its pervading smell. In a similar manner we are indebted to the ear for much that gives an individuality to every different land: the incessant and dinning notes of grasshoppers, the harsh grating cry of tropical birds, the hum and accent of a foreign tongue, the plaintive chants with which labouring men pursue their vocations, have all a character of their own, and are alien to the experiences of our mother country. We may easily understand how a blind traveller like Holman, in roaming from land to land, may feel the delight of endless change, as well as the mere pleasure of locomotion; and, on the other hand, how impossible it is to convey the entire notion of a foreign country as acquired by a man in the full enjoyment of his physical senses, to another who receives his only instruction from books, prints, and maps; or in other words, through the medium of his eye alone.

Yet, though we cannot hope to invent any method by which a student at his fire-side may inform himself as justly of a foreign land as if he had actually travelled there, let us, at all events, do what we can, and try to record in our ordinary maps *all* the impressions that the eye takes in; I mean both colour and side views, as well as mere plans.

It is by no means a portfolio of sketches that fulfils the desire I express of seeing the complete picture of a country

presented to the eye; but it must be from a compilation of many views that the artist would be able to combine his graphic picture with a sufficiently faithful ground-plan, and I must repeat my conviction that this is a branch of map-making which has been unduly neglected by our geographical artists, and it is sincerely to be hoped that the partial success which has attended recent efforts will encourage further attempts.

The maps of the Crimea have already been alluded to, and many other bird's-eye views of different towns and countries had preceded them by a few months. The great development of the art of coloured lithography offers great assistance, and may be the foundation of a more natural way of representing the general aspect of a country to the mind of a student than can possibly be accomplished by the most laboriously engraved maps of the present day.

An endeavour has already been made to convey to the mind of the reader who may approach this subject for the first time some idea of the vast amount of work that has to be accomplished before an accurate map of the world can possibly be completed, and we have also alluded to the number of labourers in the field of geographical inquiry, chiefly in distant countries, who collect information as amateurs rather than as professed surveyors. Under these circumstances, it may well be conceived how useful a part is played by Geographical Societies who endeavour to draw to themselves all those scraps of information that otherwise would be scattered over the face of literature, or never be published at all. There is, indeed, no science that requires a system of centralization more than geography, for its materials are gathered from peculiarly distant sources, in a great variety of languages, and from many persons who have neither inclination nor opportunities of publishing. Collections of the original manuscript maps drawn up by explorers, and of which these societies are the natural guardians, are of especial value, for the printed chart which is attached to a traveller's book and received by the world as an authority, is too often an inaccurate rendering of the scratched and blotted manuscript from which it has been compiled. Indeed, with the best intentions, it is hardly possible for a map-maker not to originate or omit some details. Blotted lines or words in faded ink may be liable to more than one interpretation, and bad writing may be misread; so that the advantage of referring to original documents is thoroughly recognised by all map-makers, when they have occasion to work up afresh the geography of a newly surveyed country. But Societies influence geography in many other ways than by merely becoming the depositaries of original documents, or as

libraries for printed charts and geographical literature,—they are peculiarly useful as centres of communication between both travellers and professed geographers.

It is of course impossible that writings, however diffuse, should so exhaust the experience that a diligent observer has gained in years of travel, as to leave nothing new to be gleaned from him by personal inquiry; nay, the science of travel and that of literature are not congenial pursuits: for however successfully the fresh interest of a traveller's earnest tale may buoy up what he writes, it is hardly probable that as soon as he has emerged from savage isolation, he should feel his pen as fluent in descriptive matters as if he had kept it in practice by the everyday employments of common life. There are also numberless objects that become so familiar by use, that their peculiarity ceases to attract the traveller's notice, and he forgets to think and write about them until some chance question happens to lay bare the omission. Or, on the other hand, he may have recollected a great deal that he thinks unworthy of record, until after inquiry has shown how conclusions of real importance may hinge upon them, in a certain though indirect way. For all these reasons a traveller's mission is not altogether fulfilled when he has returned home, published his map, and printed his book; but it is a great advantage to geographers that he should still be within reach of interviews and inquiries. Moreover, few qualified men have started to travel in distant countries—at least if their object in visiting them were such as to attract a reasonable share of general interest—who cannot bear grateful witness to the timely aid and information which these centralizing institutions have been the means of their receiving. And their moral influence is not to be disregarded, by which they sustain the courage and perseverance of a traveller, whose special tastes find little countenance and sympathy from the associates whom the accidents of birth and neighbourhood have made nearest to him. Lastly, when geographical doubts affect the questions of the day, whether they be on matters of war, commerce, colonies, or science, the existence of these Societies affords means of eliciting discussions, and an expression of opinion from all those who, being within reach, are among the best qualified in the whole world to give it.

The French, in 1822, were the first nation who established a Geographical Society, in the wide acceptation of the term; although at least two distinguished associations for special geographical objects had existed in England during a long time previously. Of these, the well-known African Association, under whose auspices many travellers were sent out, dated

from 1788, and the Palestine Association, by which Burckhardt was patronized, from 1804. Moreover, the Raleigh Club flourished—a society of gentlemen interested in geographical matters, who by subscriptions and influence promoted explorations. The two first of these were merged into the Royal Geographical Society at, or shortly after its institution, in 1830, and the Raleigh Club has now ceased to exist as an independent body. In 1833 the Bombay Geographical Society was formed, not only to promote the knowledge of India itself, but also of Persia, Arabia, Thibet, and other countries, with regard to which Bombay was centrally placed, and with which she had more immediate opportunities of communication than were possessed by Europe. Next in order came that of St. Petersburg, which emphatically constituted itself a ‘Russian’ society,—not in the sense that its investigations were to be confined within the bounds of Russian territory, but limited to matters which conduce to Russian interests. Nevertheless, in despite of the secrecy which forms so large an element in the policy of Russia, and of the jealousy with which she circumscribes trade and hinders travel, she has—it is difficult to see with what consistency—been an eager promoter of geography in all its branches. Many routes across the vast tracts of Northern Asia have been explored with care and expense, arcs of the meridian measured, the Polar shores of Asia surveyed; and it was amid the enthusiasm excited by the successful return of Middendorf from an extensive exploration to the frontiers of China and back, through many and most imminent dangers, that this Geographical Society of St. Petersburg was established, in 1845. Berlin and Frankfort; and New York in 1851, complete the series of these Associations, as at present established.

It is quite remarkable, in turning over the published Transactions of the Geographical Society of England, and reading the consecutive addresses made by its presidents on the progress of geography in each year, to observe what vast strides have been made during the last quarter of a century, and how steadily progressive is the accumulation of its materials. We read of the publication of accurate maps of nearly the whole of civilized Europe, (Scotland being almost the only unmapped country in it), of India and large parts of America. Vast masses of additional information of all parts of the world, barely or imperfectly known before, have poured in. Great tracts, utterly unknown at the commencement of that period, have been opened out by the explorer to the colonist and the trader, and an advance has been made, which is too little marked by persons who simply refer to maps of continents on single

sheets. On these, indeed, they see no new great rivers or mountain chains, unless it be in Africa or Australia; errors of sixty or a hundred miles are barely perceptible without direct measurement on such a scale as that. But let the student of history, whether in our own or ancient times, compare the best maps of the country he is interested in with those that were extant thirty years ago, and his instance will be a very exceptional one if he do not find a most sensible difference between them. Thus, let us go to the East: what should we have known of Asia Minor if Sir C. Fellowes, Hamilton, Kippaert, Lapie, and Tchitchatcheff had not been there and written on them? Again, a step further to the Holy Land:—it was only in 1837 that the Dead Sea, lying as it does in the depths of an abyss 1400 feet below the level of the Mediterranean, from which it is little more than forty miles distant, was ever suspected of being depressed at all! Yet, before long, a traveller will be able to take his map of those countries, and explore their beauties by its aid as he wanders along their valleys, with nearly the same degree of confidence that a pedestrian wanders about the passes of the Alps, with no other guide than a pocket *Keller*.

It is not intended to compress within the following pages any kind of summary of the recent progress of geographical discovery; for the number of travellers is so great, and the scenes, dates, and objects of their labours so very various, that it is quite impossible to treat the matter in a truthful manner, except at a very great length. Epitomes of names and places could certainly be drawn up, but these would be quite unattractive to the general reader, and barely intelligible without the accompaniments of maps constructed specially to show the different routes to which they referred. If there were some one definite object, after which large groups of these travellers were steadily striving, it might be a source of great and growing interest to show how each successive expedition fared in gaining its footing in the land; how it struggled a little further than its predecessors, and finally turned back, struck by sickness, paralysed by exhausted resources, yielding to the threats of the natives, or baffled by the desert soil. But there is too little unity of endeavour in the attempts that travellers have made to admit of this kind of treatment, without sacrificing truth to the artistic development of a plot, and handling the matter as a novel writer rather than as a faithful annalist. And speaking from a purely geographical point of view, the interest that attaches itself to recent expeditions is entirely wanting in a retrospect of bygone attempts; for the surmises and hopes with which each traveller had invested the

unexplored country immediately ahead of him have been already explained or fulfilled. Each explorer spends hours in catechising natives and in speculating on what they told him,—in following up faint hints, and combining and comparing statements, with the hope of becoming a trustworthy authority, not only upon the country he has traversed and surveyed, but also over wide tracts of adjacent kingdoms, where circumstances prevented his penetrating. But these arguments and surmises, partly true and partly false, fall flat to the ground, and are utterly superseded by the first traveller who actually visits and explores them. What had before excited high interest, acute and learned speculations, and, it may be, angry controversy, is laid at rest for ever by the simple report of one competent eyewitness. On this fresh authority the practical geographers of the day draw, in hard lines, a new river where before they had indicated its supposed course by a row of dots,—shift a patch of country into different longitudes, add a certain number of new names and dotted lines, and then set to work, speculating and writing papers, as before, on what lies beyond the frontier line of positive knowledge, until another explorer has gone and returned, and pushes the domain of speculation a step further. In a mere epitome of travels, it is the more difficult to invest these bygone matters with renewed interest, as in unexplored countries the maxim of '*omne ignotum pro magnifico*' is especially appropriate, and the exciting prodigies of old native report are found to sink into very sober proportions under the actual measurements and numberings of modern travellers. But a few words may be added upon the more pressing tasks which geographical explorers have yet to accomplish; and though most interesting questions are waiting to be solved in all parts of the globe, yet as Africa and Australia afford by far the greatest fields of unknown country that remain on the face of the earth, it will be sufficient to confine our remarks to these two continents alone.

We may leave aside China, with its one-third of the human race, as impracticable to those who have not, like Messrs. Iluc and Gabet, prepared themselves, by tedious pupilage and long residence, for travel in that country. The interest of the Polar regions, and faith in any hyperborean tract of land and water is now exhausted; and we probably are sufficiently acquainted with all of it that is worth knowing. Of the main features of North and South America we are sufficiently well informed, and as to their details, we may wait until the advance of civilization makes it more important to know them still further; but in Africa, as in Australia, all is still uncertain, though the veil is on the point of being withdrawn, and even now, as these

pages are being printed, we have vague reports through Dr. Eckhardt of some vast inland sea, like another Caspian, lying at the foot of snowy mountains under an equatorial sun. It is in these continents of Africa and Australia that a traveller may hope to win the most brilliant results, and it may therefore be well to consider what are the best openings that they appear to afford.

And to Africa we will give the priority, for it is justly her due, since the secrets of her interior have been a riddle over which so many generations of geographers have puzzled. It is indeed remarkable, what vast amount of skilled energy has been shattered against her impracticable sides,—what eminent perseverance has been called forth by the allurements of African travel on the one hand, and the fatal obstacles interposed on the other. It is a land well symbolised by her traditional sphynx, tempting us with worthless riddles, and repaying failure with death. But now, quite recently, so vast a progress has been made in our explorations, the power of steam, in ascending her rivers when swollen with the rains and running high above their pestilential banks, has been so signally proved, that we may confidently expect to have the main features of her interior placed upon our maps before many years are over, with some approximation to the truth. We now have some right to argue about the boundaries of that basin which feeds the Nile; for the vast mountainous tract, which the snows of Kilimandjaro and of Kenia have proved to exist, can hardly be without some immediate connexion with it on its northern and western sides. We know for certain that Lake Tchad is a Mediterranean sea of sweet water that receives the drainage of a vast basin and has no outlet, and that its small altitude of some three hundred feet above the level of the sea, as ascertained quite recently by Dr. Vogel, renders it out of the question that it should give any tributary to the upper Nile, whose altitude above the sea is of far greater amount.

We have at length some definite knowledge of the Niger river system, owing to the successful ascent of the Tchadda last winter, by which, also, a vast number of routes, including those compiled by Dr. Barth, have become adjusted into place, and fixed with approximative accuracy; for their position depended upon towns on, or adjacent to the upper part of that river. The broad belt of unexplored region south of these parts is sensibly diminishing,—‘the candle is being burnt at both its ends.’ Dr. Livingstone’s most brilliant sweep last year, from the advanced posts of South African discovery, and up to which he had himself been the chief discoverer, cuts

a huge slice from its *terra incognita*. He visits a stream, which was described to him as the main source of the Congo, the largest of African rivers, with respect to the volume of water it pours into the sea; and besides, if his Lecambye be really the Zambesi (which mere inquiry at Quillimane from the negroes there will soon set at rest), we are also informed by him of the sources and upper course of that important river. Where, then, is the present opening to an explorer in Africa? Unhesitatingly, we may answer, let him go to the snowy mountains by Kilimandjaro, determining the watershed of the land immediately to their interior, and setting at rest for ever the problem of the source of the Nile, which, since the time of Herodotus, has been the puzzle and opprobrium of the geographical world; or else let him start from the mouth of the Zambesi to explore the great fresh-water lake Nyassi, the so-called Maravi, which like another Lake Tchad, appears to receive the drainage of a vast basin and to possess no outlet; or lastly, to leave either Benguela or Loando, and steer to Zanzibar. The conditions essential to success are, either to follow well-frequented caravan routes, or to gain the goodwill of some powerful chief, and to travel in whatever direction his name has authority or recommendation. The bane of travellers in Africa is the numberless tribes into which that country is split up. The normal state of neighbouring tribes is to be at exterminating war, and to have their territories separated by a broad belt of land, uninhabited, except by outlaws or outcasts, and the scene of continual forays. The denser the population the more frequent is the resistance; and as to rivers, which should afford a track open to commerce and intercourse, they are precisely the lines along which it is most difficult for a small and unprotected party to travel.

Again, as, if a tourist in civilized countries had no banker, no cheques, no notes, no gold, nor even silver, but had to lay in his store of money to meet all travelling expenses, in huge bags of pence and halfpence, it is obvious that his means of locomotion must be considerably retarded. And a large party of tourists would fare no better than a smaller one; for, after a certain size, the expense of a party is in pretty exact proportion to its numbers; and if more money bags be carried, the calls upon them for the cost of carriage is proportionably greater. This is exactly the case with a traveller in Africa. His articles of exchange are extremely heavy; his currency is iron, and glass beads, and bales of calico; and his power of transport very limited. The tribute that he has to pay at each successive frontier is probably a large per centage on his entire

property. He is, in fact, mulcted in so many quarters that, unless means exist by which he may procure fresh supplies, he cannot possibly travel for many months. He may start with as much as he can take with him, but the exigencies of a long journey, and of the large party that is required to take charge of a caravan, reduce his stores effectually; and he is lucky if, after six months' journeyings, he finds enough left to ensure full rations until his return to the *dépôt* whence he started.

It is a mistake too often made, that in a country where natives exist, a white man who has his wits about him, is sure to find enough upon which he also may live. But it is not so. A savage is skilled at finding the proper roots, is able to digest worthless rubbish, which a European stomach would reject, or be poisoned by; he is able to subsist one, two, or more days without anything whatsoever to eat, whilst a European, who has not served a hard apprenticeship in bush life, is faint under a hot sun at the loss of his breakfast or his dinner. Added to this, a savage's whole time, from morning to night, is employed, during the scarcer time of the year, in hunting about the country for his food: he lives like the beasts of the field in barren countries, who never cease to hunt for and crop up the scanty blades of grass; and yet grass is far easier to come at than roots edible by man. A savage has no leisure to travel, unless his food be given him. It is the same with cattle; for when grass is scanty, an explorer will find it scarcely possible for him to move on. The daylight hours, during which alone it is safe to let the animals seek for their pasture, are scarcely long enough to supply them with food; and if they be encroached upon by travel, the animals must starve. It is only along a river side, or in a well-watered country, that travellers can creep forward, step by step, an hour or two each day, according to their strength. In desert lands, such as those we are speaking of, if the traveller moves at all he must be prepared to move long stages, and these without food are impracticable.

The weight of the Portuguese rule extends very far from both coasts of central Africa, and the authorities have acted in a most liberal spirit to strangers accredited from other countries, showing every desire to promote geographical inquiries; but whether their traders might not resist the progress of a traveller, when in distant parts, on some petty mercantile grounds, with the same obstinacy and effect as ours have done in more than one instance—witness, for example, in the late Mr. Ruxton's unsuccessful attempt to explore South-west Africa, from Walfisch Bay,—is another matter;

but certainly the traders whom Dr. Livingston met in his recent explorations appear to have been ready to aid rather than to resist. There is surely a great opening to legitimate and civilising commerce in the quarters that have been mentioned above, and a man would deserve well of the opinion of the world if he succeeded in exploring them.

Australia affords another and a most legitimate field for a traveller, and perhaps a more encouraging one than Africa; because whatever discoveries are made in that continent are more sure of being followed up, and of leading to immediate results. The peculiar difficulties that travellers have to contend with there, are almost identical with those experienced in the best-known parts of South Africa. There is, in both countries, the same union of desert and equatorial verdure, the same alternate floods and droughts, the same fear of the country drying up behind the explorer. In both, the means of travel and sustenance are similar,—driving slaughter cattle, using wagons and carts; but whereas the desert, or rather the prairie part of South Africa is now thoroughly understood, and its borders ascertained, for which we are much indebted to Mr. Andersson's recent travels and inquiries, that of Australia is still unexplored; and it is precisely in the difficulty of ascertaining it that the problem of that island-continent appears to lie. Such an excellent map of Australia has recently been published by Mr. Arrowsmith, that it is superfluous to enter into any details of the present state of discovery in its interior, since a mere inspection of the map will tell more than pages of explanation. We know the rim of the continent, and that great slice of its south-eastern corner which is actually colonised; but of the rest, with the exception of Sturt's and Kennedy's famous expeditions right into the centre, we know nothing. There is every reason to guess that the central desert fills up two-thirds of the unknown parts,—the hot dry winds and other climateric effects all combine to indicate this; but what oases there may be within it, or where the northern boundary of the desert may lie, we are entirely ignorant. The natives in Australia can give us no information; they are split up into numberless tribes, that speak different dialects and hold no friendly communication with one another and rarely fraternize with travellers. An Australian explorer passes for hundreds of miles, gathering knowledge of nothing beyond what his eyes can actually see; the natives flee from him, he sees only their tracks and their distant fires, and hears their characteristic cries from time to time about him; but as to what lies on the other side of, it may be, the hills immediately to his right, or beyond the waste of sand which bounds his

view to his left, he can only guess. If, then, a large map of Australia be taken, and on it be painted just that narrow band of country of which alone Captain Sturt and others can speak with any certainty, it becomes plain to us at once how slight is our knowledge of the great interior. Now, in order to discover the limits of any central desert or prairie, when once it is known to be very large, it is of course a more natural plan to skirt it, travelling over fertile tracts, than to try and cut across it; for by doing so the difficulties and risks of the desert may be avoided, while in the latter case they are courted. It is upon this principle that the plans of the North Australian expedition, which has very lately left our shores, have been organized. Everything seems to indicate that the northern face of Australia is fertile: many rivers of a certain magnitude pour down into the Gulf of Carpentaria, and on either side of the promontories that form it; and as water in these latitudes is almost synonymous with fertility, there can be little doubt that the slope or watershed down which these rivers run is no longer desert. The expedition has started to sail up one of these rivers—the Victoria, which was discovered years since by Captain Stokes in the *Beagle*, and was ascended by him for some distance,—then, having examined its source and the character of the country whence it takes its rise, it will endeavour to reach the sea by another route, so as to descend the Albert river into the Gulf of Carpentaria, and rejoin the vessel from which they landed, and which will be stationed near its mouth to bring them away again. The government of South Australia has also equipped an expedition to explore the side of the desert adjacent to its territory, but what will be the success of both these undertakings remains for us to learn. Expeditions in Central Australia involve so great an outlay as to preclude all chance of their being undertaken by the enterprise of a single private person; servants' wages are of course enormous, and a party of less than ten or a dozen men is not advisable; whatever these men eat must be bought from the colonists at Australian prices, and taken on by the caravan. The country affords nothing but firewood and water, for the natives have no cattle, and of course no corn, which they may be induced to exchange for articles of barter. A caravan, therefore, sets out provisioned for a definite time, like a ship at sea, but with a thousandfold greater risk with regard to its freight. If the animals of the caravan perish, the party must perish too, unless that hand of Providence which every traveller in wild countries learns to acknowledge, is pleased to sustain its struggling course towards home

by the aid of occurrences, themselves unusual, being combined in most fortunate and unlooked-for coincidences.

Fever is the special bane of travellers in distant lands,—not necessarily a fever that kills, but one that acclimatizes the sufferer, and half ruins his constitution in the process. And the worst of it is, that a similar tempering has to be gone through when the traveller returns to the climate and the way of living that he had left behind him. Indeed, the wear and tear of body and mind is so great, that it is difficult to call to mind half-a-dozen explorers who have attempted as many as three great expeditions. We are as soon satiated with the novelty of exploring as with any other kind of novelty; and, though the charm of bush life is neverfading, yet a man who has travelled much is contented with nearer lands, and does not care to incur afresh the anxieties, the disappointments, and the certain risks of actual explorations. However it may be, rough travel in unknown countries has, at first, an indescribable charm to most minds, and the many moral lessons that it rudely teaches are of undoubted value. Still, in times of peace, when we are, perhaps, overcareful of life, there seems to be a degree of recklessness in commending a career whose risks are certain, and whose success is remote and contingent; but a state of war cancels these feelings; for when the professions of so many of our contemporaries are fraught with equal danger, there seems less harm in advocating that of an explorer, and of wishing ‘God-speed’ to those who undertake it.

F. G.

