

I see my friend, Mr. Thacher Clarke, thinks the same. From the head of the Gulf of Adramyttium to the mouth of the Aisepos is about 70 statute miles. It is exposed to flank attack the whole way from the east. When you get to the mouth of the Aisepos, I think you would have about another 45 miles to Lampsakos—altogether about 120 miles. The last 45 would be exposed on its flank to the Sea of Marmara. I confess I cannot imagine any general would undertake such a march as that on a single line, without holding the whole of the interior of the country. The danger of it seems to me to be simply enormous. Lord Bryce asked a question with regard to the scrub on the plain of Granikos. I am afraid my photograph must have been misleading. On the plain of Granikos itself there is no scrub; it is all either grass or cultivated. The banks of the river are covered with bushes; the plain itself is almost bare and exactly suited to the phalanx. The passage of the river itself was, of course, not very well suited to the phalanx. The first attack appears to have been made by the light troops, and the phalanx must have been rather at a disadvantage. However, it did get across. The limestone and the granite near the Scamander Gorge do not belong to the Tertiary strata. The limestone there is part of the metamorphic skeleton of the Troad. I do not know exactly the age of that limestone; it is possibly Palæozoic; certainly not later than Mesozoic. The southern end of the gorge is igneous serpentine, with some granite in the neighbourhood. But that is part of the Secondary and, I think, later than the limestone.

I must not venture to follow Dr. Mill into the great desiccation question—I do not think there is any evidence on the problem in the Troad itself. The Southern Troad was famous for its fertility in antiquity, and there is no reason why it should not be equally fertile to-day, except that the Turk is no agriculturist, and very much prefers to make money, in the north by the valonea oak, which requires only the collection of the acorns once a year, and in the south by the olive, which requires little attention so long as the irrigation, which in this district is very easy, is kept up.

It was interesting to find that the olive forest is to a considerable extent in the hands of small owners, whose property is reckoned by trees, not by area; some owned as little as one tree. A large area, however, has passed into the hands of one firm. There should be material here for a curious study of small ownership in competition with the large estate.

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## GEOGRAPHICAL PROBLEMS IN BOUNDARY MAKING.

Colonel Sir Thomas H. Holdich, K.C.M.G., K.C.I.E.

*Read at the Meeting of the Society, 3 April 1916.*

THE political atmosphere will soon be charged with discussions relating to the revision of frontier and of international boundaries. What the physical nature of such boundaries should be—whether they should be designed so as to give special opportunity for the interchange of social courtesies and the promotion of brotherly good fellowship between contiguous peoples, as some writers and theorists who have a hopeful view of the regeneration of humanity advocate; or whether they should conform as far as possible to the nature of physical barriers opposing unauthorized

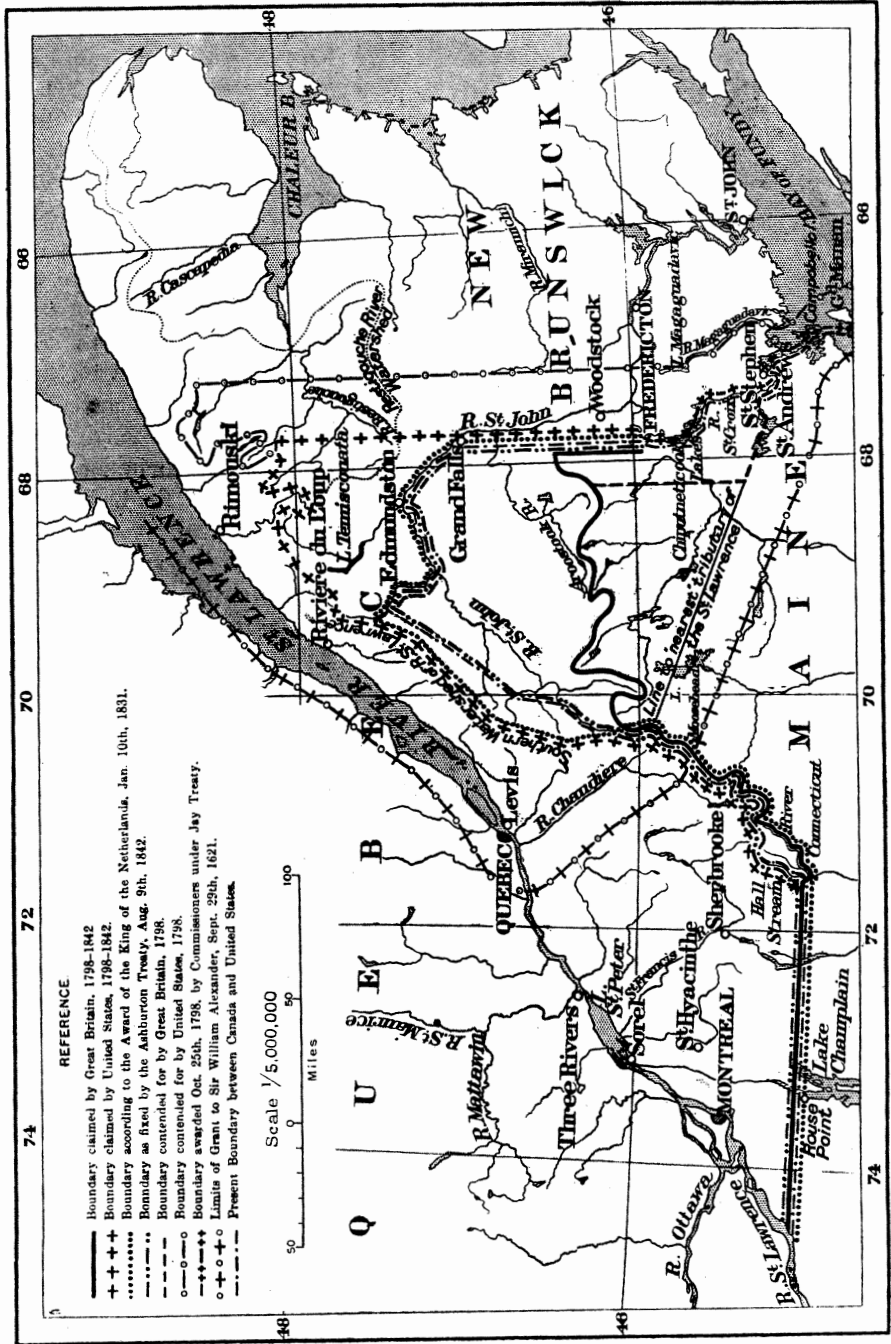
expansion and trespass into the neighbour's territory and thus destroy the germs of frontier dispute—such boundaries indeed as have been found practically necessary, is rather too large a question to tackle in one evening's paper. I shall confine myself to-night to a reference to some of the geographical problems which beset the business of boundary making, and endeavour to show you how the advance of elementary geographical knowledge within the last fifty years has minimized the difficulties and the dangers of international dispute arising from geographical ignorance.

The delimitation of an international frontier is the business of treaty makers who decide on trustworthy evidence the line of frontier limitation which will be acceptable to both the nations concerned, with all due regard to local conditions of topography and the will of the peoples who are thus to have a barrier placed between them. These are the two first and greatest considerations, and they involve a knowledge of local geography and of ethnographical distributions. Dependent thereon are other important matters which may largely influence a final decision—matters which may include military, political, or commercial interests, but all of which are subject to geographical and ethnographical conditions. It is only quite recently—within the last half century or so—that geographical knowledge has been considered an important factor (or considered a factor at all) in the education of the political administrator.

Fifty years ago the whole wide area of scientific knowledge embraced in the field of geography was narrowed to a ridiculous little educational streamlet which babbled of place names and country products. Scanty as was the educational value of geographical teaching fifty years ago, it was almost equalled in its feebleness by the practical knowledge of the subject which included the all important matter of map-making. True we had our geodetic scientists, and much profound thought and practical energy had already been devoted to solving the riddle of the Earth's form and dimensions, such as laid the foundation for an after extension of valuable bases for surface measurement which would sustain the building up of maps. But it was not the development of map-making alone which led to the better appreciation of the absolute necessity for scientific geographical education in the widest sense of the term. It was the discovery that we were being left very far behind in the field, not so much of pioneer research (there we have always held our own), as of that practical knowledge which profoundly affected our position as a commercial nation, our prospects in the military field, or our political dealings with other countries when the question arose of partition or spheres of interest, that forced the conservative hand of our educational administration and led to the formation of geographical schools throughout the country. In short, it began to be quite clear that geography was a science that had to be reckoned with, and which it paid pre-eminently to study.

We have found now by the experience of the last twenty to thirty years that certain provisional methods, methods which involve the use of a

EASTERN CANADA—UNITED STATES BOUNDARY.

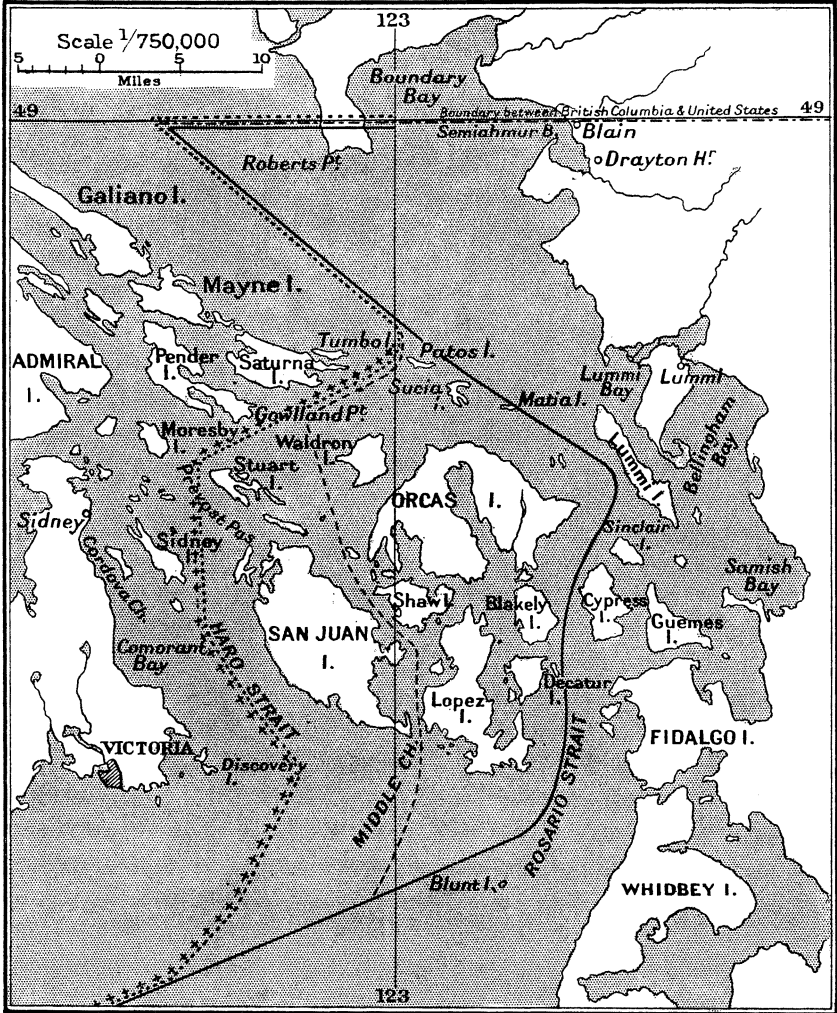


smaller class of instruments and wireless telegraphy and lead to rapid progress in advance of strict geodetic measurements, are quite sufficient to enable us to spread out our map system on comparatively small scales of work over the vast areas that are of primary interest to the commercial, military, or political geographer, without the accumulation of any error that would invalidate the map. This is the sort of work nowadays which is voluntarily undertaken by many travellers, and which gives us results that are far beyond those of earlier geographical pioneers in value. It is this sort of work which is wanting whenever a political discussion arises as to respective spheres of national interest in wide and only half explored regions, and which usually remains wanting. It is often the fact of the possession of geographical data of the most absurdly elementary type that enables the commercial pioneer to succeed in striking effectively in the development of a fresh trade area. The details of such work concern the actual processes by which frontiers are secured, and belong to the demarcator, who completes the boundary demarcation when delimitation has taken shape in the form of an agreement or treaty between the high contracting parties. It is with the form of delimitation, and the primary necessity for trustworthy geographical information in the first place, and of sufficient geographical knowledge to prevent the misuse of technical terms that we are now concerned. This is an age of boundary making, of partitioning and dividing up territory, and it has by no means come to an end yet. It may well continue as long as the world endures. The territories to be partitioned, to which political boundaries have to be set, may be those of highly developed and well-mapped countries, or they may be dark and remote, and guiltless of any map-illustration which can be accepted as good enough to guide the work of demarcation. All sorts of countries, under all sorts of governments, from the black barbarism of Central Africa to the hot-house civilization of South America, have been subjected to the process, and of all of them may the same thing be said, *i.e.* that the process of frontier defining has resolved itself into a strictly geographical problem. It must always be so. A boundary is but an artificial impress on the surface of the land, as much as a road or a railway; and, like the road or the railway, it must adapt itself to the topographical conditions of the country it traverses. If it does not, it is likely to be no barrier at all. Boundaries have been twisted out of every conceivable natural feature with more or less success. The first preliminary to a boundary settlement should be, if possible, a reasonably accurate map of the country concerned; but this is not always available, and it may happen that the mere agreement between two countries upon an abstract definition may be all that is necessary or possible for the time being. In that case, a store of future trouble is laid up if, in the terms of delimitation, it is not made clear that this arrangement is provisional only.

Here, then, we find the first rock upon which delimitation treaties split. It is the want of geographical knowledge. If, indeed, it is compulsory

ignorance, if there is no possibility of waiting till maps can be made, the arbitrators are forced into the position of adopting the worst of all possible

### SAN JUAN WATER BOUNDARY.



- Boundary contended for by Great Britain.
- ..... Boundary contended for by United States.
- + + + + + Boundary awarded by Arbitrator, Oct. 21st, 1872.
- - - - - Compromise offered by British Commissioner.

expedients—the straight line—then a provisional or inelastic agreement must take the place of a more elastic boundary.

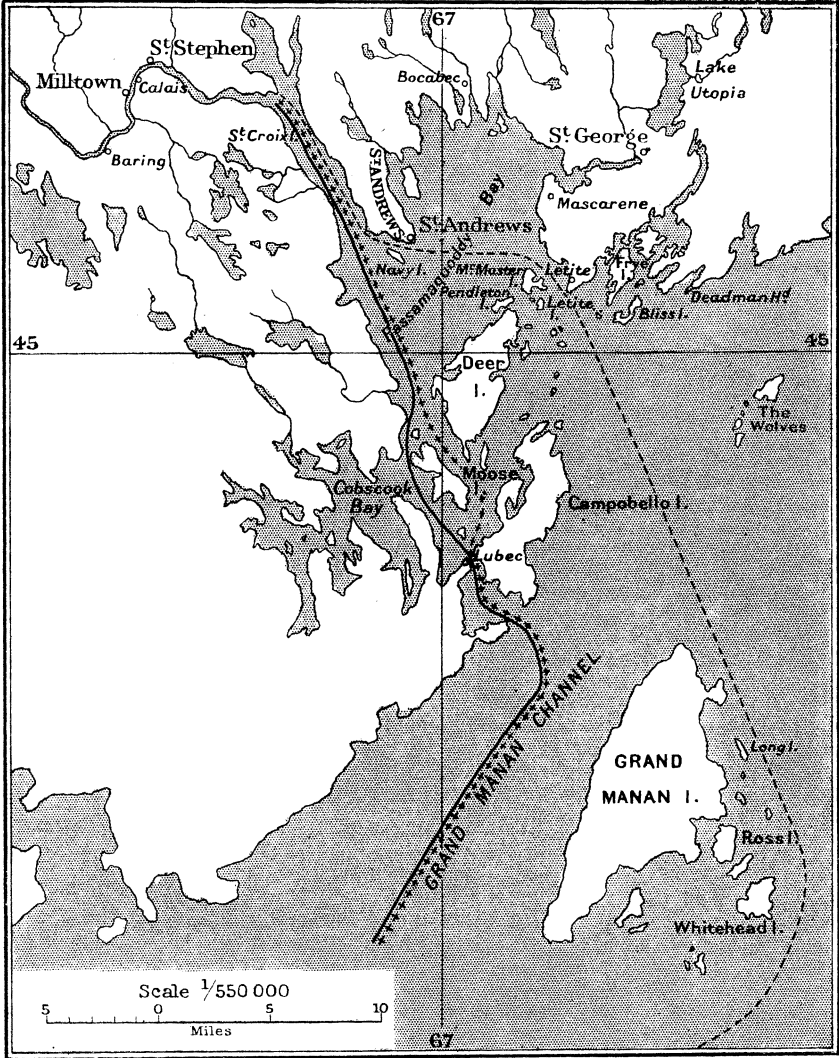
Some very notable instances have occurred lately in connection with boundary settlements in Central and Southern Africa which illustrate the

disadvantages of the straight line. In one case a meridian line was selected before even such preliminary investigations were concluded as might have determined a fairly accurate longitude and fixed a point on that meridian. The result was an awkward international complication as soon as it was discovered that a wide tract of valuable land had been erroneously assigned to England which subsequently had to be transferred to Belgium. In that case I think I am right in stating that quite enough of the geographical features of the country were known to decide whereabouts the dividing line ought to run, only unfortunately the meridian fixed upon did not happen to represent that line. There was little excuse for the mistake. In another instance a definite meridian was adopted which traversed a desert—the Kalahari desert—of South Africa. This is the eastern limit of what was German South-West Africa as it stood before the war. Now a desert may form an excellent frontier in itself, just as may the highest altitudes of a great range of mountains where the eternal snowfields and the remoteness of an uplifted wilderness are never trodden by the foot of man. It is true that even in deserts, African or Asiatic, wild nomadic tribes may exist who can band themselves together for mischief and who can raid across the frontier into each other's territory; and to them it may be desirable to point a landmark, either natural or artificial, and to say "You may not pass that mark." Outward and visible evidence of a barrier is the only thing they can understand. But how does a meridian help the matter? It is not only neither outward nor visible without demarcation, but it may be very difficult and very expensive to determine. In this case a lengthy series of geodetic triangulation had to be carried from Cape Colony to the south of the boundary till it entered German territory, entailing years of scientific labour in a most unwholesome climate, and costing a sum equivalent to the value of many thousands of square miles of useful geographical mapping, in order to determine with some approximation to scientific exactitude where that meridian really lay. This was before the days of wireless receivers and the interchange of time signals.

Next to absolute blank ignorance of the geographical conditions which prevail in the theatre of boundary operations perhaps the sharpest and most dangerous rock in the delimitator's course is an inaccurate or assumed geography on which to base his treaty. Perhaps the most remarkable instance in recent history of this form of delimitation error is afforded by the dangerous antagonism which arose between the two great South American Republics of the Argentine and Chile with reference to the partitioning of Patagonia. Patagonia had only recently emerged from primæval conditions of barbarism under Indian occupation. Opportunity for exploration had been small, and the usual result of geographical enterprise along the Pampas bounded by the Andine foothills had been disastrous to the geographer. Such knowledge as was at the disposal of the high contracting authorities who met in July 1881, to frame a treaty which should dispose of Patagonia between the two claimants, had been furnished

chiefly by old-world records of missionary enterprise which were seldom illuminating as map illustrations of the Andine territory. Later and

ISLANDS IN THE BAY OF FUNDY.



- Boundary claimed by Great Britain.
- - - - - Boundary claimed by United States.
- · · · · Boundary as fixed by Commissioners appointed under Article IV. of the Treaty of Ghent.

more scientific inquiries carried out by competent explorers revealed the fact that the text of the treaty was based on inexact geographical knowledge. Throughout the northern territories of these two republics

the international boundary for thousands of miles had been determined by a line which was eminently satisfactory to both parties. It was the great divide of the Andes which parted the waters of the Pacific from those of the Atlantic. Nothing could have been better. As a natural barrier it is magnificent ; as a definite line of partition facing the trespasser either way it may perhaps be difficult to recognize here and there, but as such intervals are just those which no trespasser from either side can possibly approach this is a matter of no consequence whatever. The extension of such a line to the extreme South of Patagonia, where the Andes end, so far as South America is concerned, was the simple and effective solution of an international difficulty that presented itself to the political arbitrators. The treaty laid down the principle that Nature's excellent management for a central water-parting should continue to furnish the boundary, and decreed that it should be maintained by the main range of the Cordillera of the Andes which parted the waters of the Pacific from those of the Atlantic to a point near the Straits of Magellan. When, however, geographical explorers took the field it was not long before they discovered that the conditions of the treaty were irreconcilable.

The Southern Andes break up into a mountain system which still contains all the grandeur of snow-capped ranges, seamed by magnificent glaciers, and presents to the Pacific a snow-crowned rampart of majestic forest-clad hills, with, here and there at intervals, the white pinnacle of a volcano dominating its walls. But on the Argentine side it softens down towards the pampas and plains into a comparatively irregular formation of lower ridge and valley, flanked by broad terraces, scarlet and purple in autumn with all the glory of the Patagonian beech scrub, and infinitely varied both in form and feature. This lesser Cordillera encloses valleys of great beauty, and is frequently traversed by lakes of surpassing loveliness, the waters of which draw this way and that, taking their sources sometimes from the flats and "Masetas" of the Argentine plains, and passing right through the mountain system to an exit in the Pacific. This, to the treaty-makers, was unexpected and vexatious, and experts on either side were deputed to prove that the boundary could follow but one course, which course (according to the side from which the argument proceeded) was either the main range of the Cordillera (*i.e.* that which was highest and most dominating) or else it was the main water-parting—the great divide—of the continent, which sometimes followed a prominent range and sometimes was lost in marshy flats. War seemed the only possible termination of the dispute. Millions, many millions, were spent in ships and armaments, and the foundation was laid for an effective army trained on the latest military principles (German chiefly) on either side of the Andes. It really appeared as if a most natural assumption of geographical conformations which did not exist were destined to set back the tide of splendid progress of which both Republics could boast, and to wreck them on the shores of a long, bloody, and probably indecisive war.



Fortunately stern good sense prevailed in the end, and British arbitration, crowned with the King's award, was accepted with deep gratitude by some and, I am inclined to think, relief by all.

Another instance of assumed geographical data for the basis of treaty making that led to results which were certainly awkward and expensive and which might have been dangerous, occurred in connection with the Russo-Afghan frontier. There was once, not so very long ago, a Liberal Government led by Mr. Gladstone, which was anxious to bring the tension of doubt and suspicion which surrounded Russia's proceedings in Asia to an end, and at the same time to deal very gently with Russia's political sensitiveness. This was to be achieved by setting a boundary between Russia and Afghanistan, and thus to draw across Central Asia a hedge beyond which Russia's progression southwards should not extend. There followed a meeting between high diplomatic dignitaries on either side (in which British interests were represented by that worst of all possible treaty makers, Lord Granville) and the delimitation of the boundary was duly effected. There may have been worse delimitations perpetuated since that day—I am inclined to think that there have been—but there has never been one in which less precautions have been taken to ensure that the map geography of the regions in question was accurate. There is this much excuse for the light-hearted acceptance of the ancient maps then in existence, that for the greater part of the delimitation, the Oxus River was itself to represent the dividing line; and the Oxus River, no matter how much displaced on the map, was a great natural feature which could not be missed. The trouble came with the definition of a particular point—the post of Khwaja Salar—as a boundary objective on the banks of that river. Great rivers which wander untrammelled and free through wide alluvial plains of their own making are not to be trusted as permanently bound by any banks which possess no artificial means of defence against corrosive action, and the Oxus (a splendid boundary in its higher reaches) is no exception to the rule in the plains of Afghan Turkestan. Two commissions, the unwieldy British and the compact Russian, spent weeks of diligent searching, with the interchange of much political controversy, over that wretched post, which was not of the least importance, and which had been washed in by the river and swallowed whole many years before the commissions met. The worst result, however, was delay in the field of Afghanistan whilst an uncertain-tempered and gout-ridden Amir (who was exceedingly anxious to be rid of the commission) dominated the political situation. It was, indeed, exceedingly dangerous, and we were well out of it.

Assumed geography hardly works more havoc with frontier treaties than does the misapplication of geographical terms. The main points of the land configuration may be sufficiently well known; maps may be fairly up to date, and the setting out of an agreement may be based on points and features that are fixed and unalterable. And yet the terms

of an agreement may lead to most unpleasant discussion as to their meaning between rival commissions in the field, and may even be the means of breaking up proceedings altogether until the high contracting parties have explained themselves. Several such instances have occurred within my experience. One of the simplest occurred during the demarcation of the boundary between Afghanistan and those tribal territories which were to be reckoned independent and beyond interference by the Kabul Government. The boundary concerned passed through an open country—a country of hill and plain where the hills were sharply defined in long and generally continuous lines, sometimes knife-edged as to their summits, with steep rocky spurs deeply rifted by water channels. From the foot of the spurs there sloped away in smooth but often steep gradients the fans formed by detritus washed down from the mountain sides forming what is locally known in Baluchistan as “dasht.” The “dasht” sometimes shaped itself into a broad and apparently smooth ramp seven or eight miles in width, a prairie land of low scrub and flowers in spring, a wide expanse of stone dusted slope in winter, which stretched between the foot of the mountain spurs and the meandering course of the nullah bed which formed the main drainage line of the valley. A very considerable length of the boundary which was to be based on the mountain range or ridge was defined as following “the foot of the hills.” Here at once was the opening for serious disagreement—and the disagreement promptly arose. What was the “foot of the hills”? Was it where the steep rocky spurs ended and the sloping grades of the dasht began? Or was it where the nullah ran in the midst of the plain and the slope from the hills could descend no farther? In the latter case one would have expected the boundary to have been defined in the treaty as being the actual nullah bed rather than “the foot of the hills.” That, at any rate, was the interpretation maintained, and the interpretation nearly led to a frontier war.

Another instance of similar slipshod definition occurred in the Asiatic highlands where the Pamirs spread out their gently sloping flats and valleys under the shadow of well defined mountain ranges. So vast and so rugged are these ranges that it is only by grace of a glacial ramp that they can be ascended, as a rule. The connection between the triangulation which should determine the points on which to base the boundary between Afghanistan and Russia in these uplifted regions and that which supplied us with a series of fixed peaks in the Himalayas to the south was exceedingly difficult. However, it was accomplished, more or less successfully, and Indian triangulation was carried into the Pamirs and connected with the Russian surveys. This was important scientifically for reasons which concerned the demarcation of a boundary based by Russia on astronomical determinations of latitude. All went well enough after the junction was completed and accepted for the purpose of supplying initial data. The trouble arose when approaching the end of the demarcation; the boundary

was defined in the treaty as running to the Chinese frontier. The definition was as follows: "From this point the boundary shall run in an easterly direction to a junction with the Chinese frontier." What is an easterly direction? A little north of east? A little south of east? Due east? The expression was indefinite, and the interpretation involved the question of certain passes (whether they were of value or not we need not stay to inquire) which were considered as important at the time. The short summer and autumn were drawing rapidly to a close. Snow was settling deep in the passes Indiawards, and it seemed possible that ere an answer could be received to the simple question, "What is an easterly direction?" the camp of the commission would be snow-bound in those vast altitudes and condemned to an Arctic existence for the next six months. Naturally there was no agreement between English and Russian camps; and they arranged to separate for the winter. Much expense was incurred in collecting fuel and selecting the best shelter available for the next six months. It fortunately happened, however, that the weakness in geographical expression had been recognized in time. It appeared to be so certain to lead to complications as to justify an early reference to the chief contracting authorities in anticipation of such complications; and the reply, which determined the conclusion of the line on the basis of ascertained topography, was received just in time (and only just in time) to enable us to escape over the passes, already deep in snow and thickly shrouded with menacing snow mists, back to sunny India.

It is true that geographical nomenclature is by no means fixed. The question has been discussed with great diligence and careful research both by the Royal Geographical Society and the Geographical Society of America, but it is not with reference to the actual facts of land conformation in nature that trouble usually arises. It matters not much whether the technical classification of land-forms is geodetic, based on the geological history of the formation, or whether it is simply physiological description expressing the character of the form in terms of its relation to other geographical features; whether the names of such features have a foreign derivation, or whether they are pure Anglo-Saxon, so long as the geographical definitions contained in a boundary treaty are technically accurate and precise in their meaning. Probably the actual loss to England due to the promulgation of boundary treaties drawn up with little or no regard to simple precision in statement could be reckoned in millions of pounds sterling. If a man were making a will full of complicated provisions, he would employ a lawyer armed with the full technical vocabulary of that rhetorical profession to make it for him. If he wishes to put a hedge between his own and his neighbour's estate he would take care that the agreement was correctly worded. But in defining a boundary between one nation and another not even the most elementary knowledge of geographical nomenclature has seemed to be considered necessary. To take the case already quoted of the boundary disagreement between the

Republics of Argentine and Chile : nearly all the trouble arose from the interpretation of the words "main range." What is a main range? I could give you many other examples of equally indefinite description, but there is not space.

There is yet another shoal in the intricate sea of delimitation (even when the delimitation is based on sound topography) and that is the selection of some impossible geographical feature to carry the boundary. This is indeed not very usual, but it is very fatal to rapid and satisfactory progress in demarcation. An instance of this occurred in demarcating that part of the Indian boundary which separates Chitral (and Kashmir interests) from Afghanistan. Here the agreement defined the boundary as running parallel to the Chitral River at an even distance of four miles from the river bank. Thus it fell on the spurs of a flanking range, about half way between the summit and the foot, festooning itself from spur to spur, cutting across mountain torrents and dividing water rights in accessible valleys, a continuous line of ascent and descent over some of the wildest, ruggedest and most inaccessible mountainside country that the Indian frontier presents, albeit it overlooks one of the loveliest of frontier valleys. Demarcation was an utter impossibility nor could, or would, any tribesman of that wild Pathan frontier pretend to recognize such a line without an infinity of artificial boundary marks. Fortunately, it was possible to suggest an alternative without any great loss of time, and as that alternative was the well-marked crest, or divide of the range, instead of being halfway down its rugged side ; and as the alternative would include a certain concession of (utterly unimportant) territory to the Afghans, there was no great difficulty in effecting an alteration in the text of the agreement. Here again the hazard of the business was delay.

References to a few of the difficulties which have occurred in the interpretation of comparatively recent boundary treaties owing to lapses in scientific geographical description only prove that until lately the great principle of recognizing the geographical function of boundary demarcation, before proceeding to political definition in detail, was misunderstood. Quite recently, however, many boundaries have been settled in many quarters of the globe (especially in Africa and in South America) which have led to no disastrous disputes whatever, and have called for no arbitration. This is a satisfactory proof of the gradual development of geographical teaching for which the Royal Geographical Society may fairly claim a share of credit. To illustrate the advance made in geographical definitions we may refer to the position of geographical knowledge in the eighteenth century. Geographical terms in treaty definitions in those days were so vague as to be almost grotesque. There is one treaty with its attendant interpretations and the disputes arising therefrom which makes a good story, and is worth a reference, if only to set a point to our satisfaction at the gradual development of this branch of practical knowledge. The negotiations for the Canadian

boundary from the Bay of Fundy to Juan de Fuca have really lasted into this century—but they commenced late in the eighteenth century. In November 1782, representatives of Great Britain and the United States signed at Paris a provisional treaty of peace. It acknowledged the Independence of the United States. Article II. provided that between the United States and Canada “it is hereby agreed and declared that the following are and shall be their boundaries, viz., from the north-west angle of Nova Scotia, viz. that angle which is formed by a line drawn due North from the source of the St. Croix River, to the Highlands; along the said Highlands which divide those rivers which fall into the St. Lawrence from those which fall into the Atlantic Ocean, to the north westernmost head of the Connecticut River; thence down along the middle of that river to the 45th degree of north latitude; from thence by a line due west on said latitude until it strikes the River Iroquois or Cataraguay; thence along the middle of the said river into Lake Ontario,” etc. The definition then deals with the series of great lakes and their connecting streams till the boundary reached the lake of the Woods. “Thence through the said river” (lake of the Woods) “to the north-western point thereof and from thence on a due west course to the river Mississippi” . . . “East by a line to be drawn along the middle of the River St. Croix from its mouth in the Bay of Fundy to its source, and from its source directly north to the aforesaid Highlands which divide the rivers which fall into the Atlantic Ocean from those which fall into the River St. Lawrence; comprehending all islands within 20 leagues of any part of the shores of the United States and lying between lines to be drawn due *east* from the points where the aforesaid boundaries between Nova Scotia on one part and East Florida on the other shall respectively touch the Bay of Fundy and the Atlantic Ocean; excepting such islands as now are, or heretofore have been, within the limits of the said province of Nova Scotia.”

On 3 September 1873 a definitive Treaty of Peace was signed at Paris in which Article II. was repeated as above.

For geographical information the negotiators were dependent on a map issued in 1755 called Mitchell's map. It appears to have been a better map of North America than any previously published, but it was a fact which must have been well known to the negotiators that much of the country was absolutely unexplored. The childlike faith with which that map was registered as the basis of an important treaty sufficiently indicates the value set on scientific geography in England in those days. The following difficulties immediately presented themselves to the demarcators.

1. Where was the river St. Croix? There were two rivers 50 miles apart, either of which might be the St. Croix of the map. The name was unknown locally.

2. What was the source of the river which was finally decided to be the St. Croix (in reality the Schoodic) supposing it had two branches (which it had)?

3. What was meant by the *north-west angle* of Nova Scotia? Where was it?

4. What were the Highlands? Did they merely represent a divide, or were they actually hills?

The discussion of these questions lasted for many years. There was a long period of acrimonious dispute lasting about fifty years over the question of the Highlands alone, during which we were more than once on the edge of a war with the United States, and geographical theories were put forward which would lead to the conviction that a sense of humour has only recently been acquired by Americans. An ancient grant of all Nova Scotia made in 1621 to Sir William Alexander and defining the borders of that province was produced in evidence of former boundaries, from which it was clear that the expression "due north" from the source of the St. Croix had been substituted in the treaty for "northward"—and the western branch of the St. Croix (or Schoodic) had been adopted for the eastern. The first piece of pedantry cost England all the northern half of the state of Maine; the latter was not of great consequence. The "Highland" question was finally referred to the King of the Netherlands for arbitration, and that wise monarch, with the geographical acumen of a Dutchman, at once put his finger on the weak spot, and after pointing out that boundary disputes based on apocryphal geography must ultimately end in compromise, he decided that a divide was not necessarily hilly or mountainous, and awarded a line from the head of the St. Croix northwards as a "line of convenience" to the "north-west angle of Nova Scotia," and from thence by the St. Lawrence-Atlantic divide to the head of the Connecticut (which river also had two heads). The award did credit to his position as king of a nation of practical geographers; needless to say this did not satisfy the disputants, and the boundary finally accepted departs from the divide (to the advantage of Britain) for a space sufficient to destroy its value as a true geographical barrier. This arbitration treaty was signed in 1842. The area in dispute amounted to about 12,000 square miles, of which about 5000 fell to Britain, who made concessions about the head of the Connecticut, where the 45th parallel had been wrongly determined.

Long before this fierce antagonism had been roused by the question of the fishing rights, and the ownership of islands in the Bay of Parquamoddy into which the St. Croix debouches. The geographical definition of a bay was called in question as soon as it was admitted on both sides that the "due east" of the treaty meant "due south." Was the Parquamoddy Bay a part of Fundy Bay? Was Fundy Bay the Atlantic, etc.? Difficulties here were not finally disposed of till the year 1910. From the head of the Connecticut to Wood's Lake there was no fundamental ground of dispute. It was found that the great chain of lakes really did link up one with another, and the only question that arose was in connection with islands in those lakes. In Wood's Lake, however, it was speedily

discovered that no line running west from the north-west corner of the lake would ever reach the Mississippi; inasmuch as that river rose south of the lakes. Consequently the effort to reach the Mississippi was abandoned, and the 49th parallel of latitude was adopted as the international boundary under the mistaken impression that it was the northern boundary of Louisiana. The nature of this extraordinary boundary from the Lake of the Woods to the sea need not be referred to, but the final difficulty of San Juan's Island renders this story of an historical geographical muddle complete. The treaty maintained that the boundary was to follow the 49th parallel to the middle of the channel between Vancouver and the mainland, and thence pass southwards following the middle of the channel round the mainland. But between Vancouver and the mainland south of 49° north latitude there is an archipelago of islands, and at least three channels that might be called main channels leading through them southwards. Chief among these islands was San Juan. In 1859 a pig was shot by an American on San Juan and the American was haled before a British magistrate and threatened with imprisonment. This put a climax to the dispute, American honour was touched, and troops were landed from both sides. It looked as if the pig incident would lead to war; but the position was saved by arbitration, the Emperor of Germany being appointed arbitrator. The award gave away the whole archipelago to the United States.

It may be added that in 1870 the Canadian boundary at Pembina was found to be 4700 feet south of its true position in parallel 49°. This was rectified and the work completed in 1874. Demarcation was effected in 1908. It has only just been completed (if indeed it is complete), but the cost of maintaining it will last through all time.

Absurd as are many of the incidents connected with the Canadian boundary, it may be doubted whether the Alaskan muddle was not almost equally remarkable. It was primarily caused by the purchase of Russian territory in Alaska by the United States, which included a strip of coastland extending roughly from Mount St. Elias in South Alaska to Cape Muzon and the Portland Canal to the west of British Columbia and bordering the Pacific. After much negotiation a convention was concluded at Washington in January 1903, which was to decide the position of the boundary by reference to a tribunal. The difficulty of decision arose chiefly from the original terms of delimitation in the treaty of 1825. The boundary was to run northward from the 56th degree of north latitude (*i.e.* the head of the Portland Channel—or canal) "following the crest of the mountains situated parallel to the coast until its intersection with the 141st degree of west longitude, subject to the condition that if such line should anywhere exceed the distance of 10 marine leagues from the ocean then the boundary . . . should be formed by a line parallel to the sinuosities of the coast and distant therefrom not more than 10 leagues. If any continuous range such as the treaty demanded had existed with a crest

uniformly parallel to the coast it might have been an ideal boundary, but the geographical impossibility of such a disposition of nature seems hardly to have been recognized, and the question resolved itself into the determination of an irregular line in a mountain region which should never be more than 10 leagues from the ocean, and which should accord as far as possible with the condition of parallelism to the coast. This involved the secondary question of what is the coast line in such an archipelago of islands and islets as that with which the tribunal had to deal. The condition of strictly following its sinuosities was an impossible one. The tribunal finally decided on a line which was a mountain boundary practically in accordance with the contention of the United States. The line joined certain peaks marked on a map attached to the award forming a sinuous boundary about 30 miles from the general trend of the shore, and is, presumably, a line which it would be impossible to demarcate. The question of the course that the line should take from the point of commencement to the entrance to the Portland Channel formed an important branch of the award. This involved the right of occupation to certain islands. By the decision of the tribunal (with the strong dissent of two of the British members) the channel of the treaty was decided to be that which passes to the north of Pearce and Wales Islands, and which transfers two other important islands, Silklan and Kanna-ghunut, commanding the channel, to the United States, from Canada. The indignation which was aroused in Canada by this decision is a matter of comparatively recent history. It did, in fact, ignore one of the most important principles of boundary making when a compromise is in question. In the scheme for a fair and useful division between rival claims generally, it is most important to preserve the entity of any one concession in particular. For instance, to divide a valley so that water sources are on one side and the irrigable lands on the other, is merely to invite the trouble which it is the whole object of a boundary to prevent. In this case the right of navigation through the channel to Canada, and the command of the channel to America by the cession of these islands, certainly seems to be a mistake.

The PRESIDENT : Turning to our business for the evening, as you will have seen, Mr. Compton, who was to have read a paper on New Caledonia, has been prevented by illness from doing so. In these circumstances our old friend and Vice-President, Sir Thomas Holdich, has come forward at very short notice and proposes to read a paper, which I am sure will be interesting, on a subject on which he is better qualified to speak than anybody in this country, that is, on frontiers and how they have been, and ought to be, demarcated.

*(Sir Thomas Holdich then read the paper printed above and a discussion followed.)*

Sir FRANCIS YOUNGHUSBAND : Sir Thomas Holdich is, I suppose, the greatest authority in the world on the practical work of demarcation of frontiers. He has demarcated the frontiers of various countries from the Andes to the Himalayas. It is commonly assumed by the man in the street that Governments are extremely stupid and lacking in foresight ; but Governments do have



lapses of intelligence and sometimes show a certain amount of foresight. It is quite twenty years ago that the Home Government telegraphed to the Viceroy of India asking him to advise them as to what should be the permanent frontier between the Russian and Indian Empires to the north of India, in order that the Government might know up to what point they should extend their influence if necessary, and beyond which line they should on no account involve themselves in liabilities. I happened to be at Simla at the time when this telegram arrived, and was asked by the Foreign Secretary to mark on the map what in my opinion should be that frontier between the Indian and the Russian Empires. I had in the years 1887, 1889, 1890 and 1891 been exploring on the northern frontiers of our Indian Empire, and the Government at any rate on that occasion not only showed foresight in asking for information as to a good line of frontier, but they did also as a matter of fact consult the man who had had some experience of it on the spot. It happens, however, that when foresight is shown the event foreseen does not always come to pass, and the advance of the Russians down towards our Indian Empire in the north which had been anticipated twenty years ago, has not occurred from that time till now. Sir Thomas Holdich has referred to the unsuitability of the River Oxus as a line to mark the sphere of influence. That line was suggested by Lord Granville in the year 1873. Looking at a map the Oxus seems to furnish a very suitable line between ourselves and the Russians, and here in London it had been assumed that the River Oxus would be an adequate line between the Russian sphere of influence and the British up from India. But in the lower parts the river, as Sir Thomas Holdich has shown, wanders over a wide open plain and becomes an exceedingly unsatisfactory boundary. In the upper parts Sir Thomas thought it was a better one, but my impression in that region was that even there also the river is not a good boundary, because in certain states there are villages on both banks. The villages on one side we have given to the Russians, and the villages on the other side we have kept for Afghanistan. I remember years ago as a young officer out in India, like many other young officers, thinking the Government at home very simple-minded, that they should believe that by simply laying down boundary pillars in the wilds of Central Asia they would keep back the Russian advance towards India. We thought the Russians would not pay much attention to those lines of pillars in the middle of deserts and mountains. But the boundary was demarcated by Sir Thomas Holdich and other officers, and it is a fact that from that time to this it has been strictly respected by the Russian Government. Since 1891 when I was myself arrested on the banks of the Oxus there has been no frontier "incident" between us, and I think that is an exceedingly satisfactory thing to be able to say.

Colonel C. E. YATE: I think after what Sir Thomas Holdich has told us there is little I can say. I think he has explained most thoroughly to us the extraordinary difficulties that have to be met by the laying down of boundaries by our Government in advance over lines of which they had no knowledge. He has given us instances of all sorts of different definitions of boundaries—mountains and rivers, and a boundary that was to run, as he told us, "about 4 miles from the river," and he has showed us in his photographs how utterly impossible it was to demarcate such a boundary. He has also recalled to us instances of boundaries defined as running "along the foothills," and pointed out how impossible it was to find out what the "foothills" were, and how hopeless it was to endeavour to come to any agreement on such definitions. Naturally where there are foothills the people in the plains work their way up into the little valleys between the various spurs to a considerable distance,

and I can remember a case in my own personal experience in which this had led to all sorts of troubles and fights and encounters between the two parties. It was a tremendous difficulty to settle a boundary along "foothills." Then again the lecturer illustrated to us the disadvantages of a "straight line." When you come to settle a boundary, the watershed of a mountain range or a big river with fixed banks is the only really permanent geographical feature you can fix a boundary on satisfactorily. If you can only get a divide between two countries you may then get a permanent boundary. All artificial boundaries lead to trouble. We can thoroughly realize the enormous expense incurred in maintaining that long straight line of the Canadian boundary which Sir Thomas Holdich has told us about. We can only hope that this laying down of boundaries in advance without any geographical knowledge of what the countries are like through which the boundary commissions have to work will cease in the future, and that the Government will come to this Society and to other sources where information is available as to what are the real natural features of the country through which the boundary has to be laid down before finally deciding upon it. Sir Thomas Holdich has told us how much good work the Society has done, and I think we can only trust that this will be recognized by the Governments concerned in the future, and we hope there will be more reference to the Geographical Society than there has been in the past before future boundaries are agreed to.

Prof. SPENSER WILKINSON: I do not think we have heard anything to-night that requires criticism in the sense of fault-finding or disagreement. I should like to say I have had this evening a very rare and great pleasure in hearing a most interesting subject expounded by probably the most competent man in the world to present it, and we have heard two other gentlemen following him who are, as near as can be, the men who, next to the lecturer, have the largest experience of this business. I discussed the matter a good many years ago with Sir John Ardagh, who had a good deal to do with the demarcation of the frontier between Greece and Turkey, and there is one remark I should like to be permitted to make. We have heard the difficulties of demarcating the frontier after it has been delimited by diplomatists, and it no doubt seemed as though diplomatists were very stupid people; but I should like to say a word, not in defence of anybody, but to explain how this may come about. As a rule these frontier disputes arise in conditions which, as you have heard, are very likely to lead to wars. Feeling is much strained on both sides, and we have two countries finding they may come to war on a point of honour when it is really a question of geographical definition. Consider what the unfortunate diplomatists have to do. They want to avoid a war, and at last they hit upon a form of words on which both sides can manage to agree, and this formula is given to geographers to interpret. I am rather inclined to think it is quite worth while to pay the expenses of the geographers and to give them all the difficulties of the demarcation, rather than to have a war over the question. I think you will find many of these questions, as soon as they touch national susceptibilities, always become increasingly difficult. There was the instance of the Newfoundland Fisheries which caused a great deal of trouble between France and this country. If you go back and look at the negotiations you will find that the unsatisfactory definition of the Treaty of Utrecht was repeated several generations later in the Treaty of Paris, and the fact was that the political relations between the Governments did not enable the British negotiators to press their point as far as they might have done. You generally find that where there has been an unsatisfactory boundary it has been because

the Government which negotiated it did not feel inclined to press its view to the point of war, and was ready to compromise in order to get a treaty. That is very often the reason why you get these unsatisfactory definitions. These were the conditions when Gladstone's Government negotiated with the Russian Government about the border of Afghanistan. The real difficulty lay not primarily in geographical definition, but in the view which this country was taking of policy. It was a period when we had a Government very anxious to keep the peace rather than to be self-assertive. You see the results in the trouble afterwards caused to the geographers. I do not think these difficulties are primarily due to the carelessness of Governments in regard to geographers, but rather to the weakness of policy or to the beliefs prevailing as to what policy should be. I think you will agree with me that the progress of geography has made geographical definition very much easier than it was fifty years ago or a century ago, and where policy is satisfactory, I do not suppose there is likely in the future to be very much difficulty about a reasonable delimitation, which will probably leave comparatively—I won't say easy—but less ambiguous than it used to be, the subsequent work of demarcation. I should like to express the delight with which I have listened to the lecture and the instruction I have derived from it.

Mr. H. F. J. BURGESS expressed a desire to raise two points. He objected to the introduction of politics which had taken place since the war at the Society's meetings. He also disapproved of the employment of military men in the arrangement and demarcation of frontiers.

The PRESIDENT: I must first deal summarily with the last speaker's remarks. It is true that, in so far as they affect "party," Politics have as a rule been excluded from our discussions. But where national interests and geographical knowledge are bound up together this custom does not hold good; least of all can it do so at a time when "party" is practically in abeyance. As to the second point, a more unfortunate occasion than the present for raising it, for disparaging the work done by our engineer officers in delimiting frontiers, could hardly have been chosen. As all who have followed recent events in South America are aware, the delimitation between the Argentine Republic and Chili, carried out at the request of the Governments concerned by Sir Thomas Holdich and his colleagues, has been the means of preventing a war which threatened to be long and ruinous to two young and growing States. So highly was their work appreciated in South America that when a similar dispute arose between Peru and Bolivia the statesmen on both sides applied for the help of British officers, with this difference—that instead of appealing to His Majesty's Government they came to the Council of the Royal Geographical Society and begged us in the final resort to act as arbitrators.

I proceed to the general question. During this Session we have had several lectures on frontiers in civilized countries. I fear that in Europe the ideal frontier from the professorial point of view will never be attained. There are too many factors to be taken into consideration: there are the physical, racial, commercial and military factors, and it is very rare indeed that you get such a perfect frontier as the range of the Pyrenees—or, I may add, the British Channel. I am afraid we shall never see absolutely scientific frontiers (scientific from every point of view) between old countries. Nationalities show no proper respect for water-partings. In new countries, however, it is a different matter. There the difficulties are of quite another order. I confess I have been very much interested in hearing Prof. Spenser Wilkinson's apology for statesmen and diplomatists, for I felt during the lecture that they very much required

some apology. I cannot, however, entirely fall in with his line of argument. Their frequent vagueness may possibly on occasions have saved us from war, but it seems to me that it has far more often brought us to the very edge of war, if not actually into war.

We have had some curious instances given us to-night. It throws an odd light on the psychology of nations, or their rulers, when we are reminded that the United States were once not too proud to be ready to fight for a small Pacific island! When we hear of such incidents as the way in which the boundary of Uganda and the Congo State was drawn along an unascertained line of longitude we cannot but feel that the diplomatists had better have consulted geographers and travellers before they committed themselves on paper. Their traditions stood in the way: what these traditions were I may best illustrate by a personal anecdote. Some years ago, while I was one of the Honorary Secretaries of the Society, I received an official letter from the Foreign Office signed by the then Secretary of State and sent in reply to a protest made by the Council against the exclusion of Geography from the subjects for examination for Foreign Office clerks. The gist of the letter was, that all the geography needed by a Foreign Office clerk could be picked up in his first few months in the Department.

Again I call to mind how one of our most distinguished Proconsuls, the late Sir Lambert Playfair, told me that only once on his many returns from foreign posts had he been met on reporting himself at the Foreign Office by anyone who cared to ask questions and listen to his replies. The exception was our frequent guest, Lord Bryce. I remember too a chance meeting with Sir John Kirk, when he exclaimed, "My life's work in Africa has just been given away in London." To-day we can reflect with satisfaction that General Smuts is putting that right, and that Kilimanjaro, the top of Africa, is no longer a German mountain!

I would not deny that there is something to be said in excuse of the official attitude. It is hard on statesmen to be called on to give their attention to details in matters which are alien to their usual interests. But where the political or military business in hand is seriously affected by geographical facts and considerations these must be taken into account under pain of disastrous consequences. It is needless to give recent instances. This war will make many changes; may we hope that among them will be a change in our official attitude, and that we shall learn to think geographically as well as imperially.

I must add, in conclusion, one word of thanks to my old colleague Sir Thomas Holdich for having come at very short notice to our rescue and given us such a masterly discourse.

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## NIGHT MARCHING BY STARS.

E. A. Reeves.

*Read at the Afternoon Meeting of the Society, 13 April 1916.*

THE subject which I have been asked to bring before you this afternoon is doubtless one of the oldest with which we could possibly deal. The heavenly bodies have from the earliest days been the natural guides of the traveller. Long before the magnetic compass was known, at any rate in Europe, men found their way across unexplored oceans and