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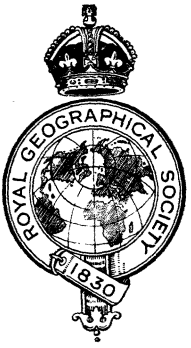

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Mazarredo executed a large amount of cartographic work dealing with the interior of Spain, as well as with home and foreign seas; and he was the first person to accurately determine the position of the famous Puerta del Sol. He was also the author of a geographical treatise, and one on navigation, both designed for the instruction of naval cadets. The late Admiral de Paula Pavía relates that the idea of deducing the longitude of a ship at sea by means of astro-lunar distances measured with a sextant occurred to Mazarredo suddenly and independently, one clear night in 1772, while pacing the deck of the frigate *Venus* with his friend and comrade Lángara; and that they instantly busied themselves with putting the project to a practical test and with elaborating the necessary calculations. Other authorities, with less romance, but doubtless greater exactitude, only claim for Mazarredo that he was the first Spanish officer to apply the lunar distance method at sea, of which, before serving in the *Venus*, he had already heard some vague rumours. It would certainly have been remarkable if—at that date—he had not; for certain it is that he was a man of wide knowledge, reading, and experience, and that he rendered useful and distinguished services to the navy and to his country. We therefore cordially congratulate our sister Society in having made the *Santa Rosalía's* voyage better known to geographers at large.

B. GLANVILL CORNEY.

NOTES ON A JOURNEY ACROSS TSA-RUNG.

F. Kingdon Ward.

We have received with these notes a large quantity of survey material from which a map will be constructed. Owing however to the pressure upon our draughtsmen due to the requirements of the war it will not be possible to complete for some time the working up of this material, and under the circumstances it seems better not to delay the publication of Mr. Ward's interesting account of the little-known country he has traversed.—ED. *G.J.*

IN the following paper I have thought it best to draw attention to certain matters of geographical interest outside the scope of my immediate journey, rather than describe in detail incidents of the journey itself; for the route followed is fairly well known from the records of previous travellers, in the footsteps of one or other of whom I always found myself. I will therefore give only a brief account of the journey and indicate or comment at greater length on more interesting problems to which attention is drawn *en route*.

Leaving Atuntsi in North-West Yunnan on 30 October 1913, we crossed by a good path over a shoulder of the high outlier which rises for 3000 feet due west of the village, and after a terrific descent reached the Mekong. Continuing up the right bank we reached Meri, and turning west began the ascent of the divide by a narrow valley. There are two

types of Tibetan village met with in the Mekong valley and elsewhere, which may be called the concentrated and the diffuse. In the former the small mud-coloured houses have in the distance exactly the appearance of a pile of children's bricks, and closer scrutiny fails to reveal any design in the jumble; in the latter case the houses are much bigger, whitewashed, and often widely separated over the terraces, each smothered beneath walnut and pear trees. Greater difficulties in terracing and distributing the water (which in either case has to be brought some distance along aqueducts) seem to determine the former less picturesque type.

The climb to the Shueh-la takes a day and a half, and the first snow was evaporating in the wind when we crossed in perfect weather on November 2. The view to the west is grand, and it is difficult to realize that one is looking across the Wei-ch'u and Salween valleys into Burma—that is, to the mountains where the Irrawaddi headwaters rise. There is also an extensive view of the Mekong-Yangtze divide all across the eastern horizon. A fine twin pyramidal snow-peak, called Obo, is seen to the north-west, and is not so far off as it appears at first sight, being actually east of the Salween. There is evidence of the former presence of glaciers on the Shueh-la, and as immediately below the pass the glittering snow-slope of the northernmost peak of K'a-gur-pu comes into view on the left quite close to us, this is likely enough.

There is a peculiarity about the flora of this range (the Mekong-Salween divide), separated into two parts as it is by the K'a-gur-pu uplift. South of that snowy portion the alpine and sub-alpine flora resembles that of the Salween-Irrawaddi divide to the west; north of it the flora of the Mekong-Yangtze divide to the east. Thus it seems to be a sort of connecting link between east and west.

The Wei-ch'u is reached in a day's march from the pass, and an excellent mule-road, better than any I have seen in Yunnan, follows the left bank to Peitu. For miles the valley is dominated by a group of snow-peaks in the K'a-gur-pu range behind us, which the pilgrims, going the other way round, keep ever in view.

Crossing the Wei-ch'u below Peitu and ascending the divide to the west we look down on that river flowing to the south behind and to the north in front, which curious phenomenon mazes one's mind considerably; the tangled ridges in the west, backed by Obo, are mostly formed by the capricious course of the Wei before it joins the Salween, a course now well known. It is significant that no less than four rivers in this region of parallel ranges which stretches from the Brahmaputra to western Szechuan —namely, the Yalung in Szechuan, the Yangtze, the Wei-ch'u, and the Ngawchang-hka, a tributary of the 'Nmai-hka in far northern Burma—turn abruptly through 180° and flow for some distance parallel to themselves in an opposite direction; and in the case of the Yalung, Yangtze, and Wei there are no less than three loops lying close against each other, as in the letter N. There must be some common cause for this freak,

probably to be found in the geological history of the country, which has perhaps been subjected to two sets of crust-movements acting at right angles to one another in such a way that the second movement has caused shearing to take place in the ridges thrown up by the first obliquely to their long axes, thus facilitating the junction of rivers originally belonging to different hydrographic systems.

There is a good view of Obo from here; it is seen to lie within the arid region of Tsa-rung, protected from the monsoon by a rain-screen to the west (the Salween-Irrawaddi divide), and its glaciers have evidently retreated some distance.

On reaching the Wei once more the country hereabouts, considering its savage nature and barren aspect, is seen to be comparatively well populated. Politically speaking, Tsa-rung Province, being astride of two out of the three roads to Lhasa, is likely to prove a stumbling-block to Chinese aggression and as great a thorn as Lololand. The people are highly civilized, progressive, and patriotic. Slavery, the old nomadic instinct redirected into trade channels, and the great annual influx of pilgrims seem to be largely responsible for their advancement. The road down (or, strictly speaking, up) the Wei-ch'u here, past Wa-pu and K'a-pu is first-rate. From the latter village there is a path across the Wei bends to the Salween which must pass close beneath Obo, no doubt an accessible peak. Leaving the Wei where it bends round from the east we ascend to another pass, and see right below us the Salween valley with a fine snow-peak in the south on the Salween-Irrawaddi divide. Chiana is the first village on the Salween, and from here we turned south. The lateral extent of the Salween-Irrawaddi divide at this point calls for remark. There is a path —an excellent one, I should think, judging by the beginnings of it which I saw—from Trenge, a village on the right bank two days' journey south of Menkong, but apparently nothing between these two. The Tibetans say it takes eight days to cross the divide here, and that three passes have to be crossed; for eight months in the year the route is closed. Allowing for exaggeration there is no doubt that the divide here is of exceptional bulk, slit by longitudinal valleys sending tributary streams to the Taron. Here, I suspect, dwell those dwarfs (Nungs, or as the Hkamtis call them Hkanungs, and the Chinese Kuitzu) whom the Tibetans say live in trees because the ground is a swamp full of snakes and tigers, and with whom they trade twice a year, their country lying to the south of Menkong. So much for Tibetan gossip. The late Captain Pritchard came across these dwarf Nungs west of the Taron, and mentions one hut perched in a tree 60 feet from the ground. The snakes and tigers add a picturesque touch which is probably imaginary, but those jungles are quite poisonous enough without them, and the Tibetans seldom cross the mountains to this outlier of their dominions, and then only to take slaves; "trade" is a very euphemistic term for the relationship, I should think. There were at Trenge several dwarf Nung slaves with faces tattooed blue; they must be

far better off in the arid Salween valley than in their own country, for they are well treated.

Does the Salween-Irrawaddi divide cease to be as a distinct mountain range in the north-west beyond the Irrawaddi sources, or does it retain its individuality as the Salween-Brahmaputra divide? From a consideration of the distribution of Himalayan plants in Yunnan I am convinced that it does retain its individual existence, and that the big snow-peak recently discovered in North-East Assam on the main axis of the severed Himalayan range is its western limit; in other words, that it is directly continuous with the Himalayan axis, having the appearance of an offshoot or spur from the latter, though actually formed otherwise. The term "Salween-Irrawaddi divide" then, for this great curved range, besides being very cumbrous, does not accurately describe it; though undoubtedly for the greater part of its length it does form the divide between those two rivers. If there is one range more than another of these narrow divides which deserves a distinct name it is the Mekong-Salween divide, *the* great divide, for it parts water flowing to the Indian Ocean from water flowing to the China Sea; and it has too something of the characteristics of Wallace's Line, separating the monsoon (Oriental or Indo-Malay) flora and fauna to the west from the Chinese to the east. Further, it separates the Tibeto-Burman family from the Chinese family, and has in reality considerable significance as a great barrier. From Chiana it is two or three days' march down the river to Saung-ta, where the Lutzu tribe begin to appear. The Lutzu speak a language very similar to the Nung language of the Taron, and I suspect the tribe of having arisen as a cross between Tibetans and their Nung slaves. In the south they approach the Chinese, or I should say rather have been influenced by them; in the north they have been influenced more by the Tibetans. They are a very small tribe occupying only a few miles of the Salween, and would doubtless have been driven out by the Lisus in the south had they not been protected by the Tibetans.

In summer we leave the Salween at Laung-ta, which then plunges through a wonderful granite gorge, and make a two days détour into the mountains, returning to the river again at the lower entrance to the gorge. Within a distance of 10 miles or less the climate of the valley entirely changes. In winter, however, the mountain path is blocked by snow, and for the short stretches required where no path is practicable the gorge is navigable if perilous.

The canoe-route is much used in winter, when trade between the Lutzu and Tibetans is carried on, salt from Tsa-rung being exchanged for maize flour and rice from the lower Salween, but it would seem with annual loss of life. Captain Pritchard speaks of the Taron as cutting through a similar granite gorge over the walls of which every tributary stream cascades, as is the case here too, and the scenery on the two rivers must be very similar. Relics of volcanic activity—hot springs, crater lakes, and even dead volcanoes—are found all down this frontier, and granite enters

largely into its composition, cropping out from the beds of the Salween, Taron, Mekong, and Yangtze to the crests of the Mekong-Salween and Salween-Irrawaddi divides; in its southern part the latter range is composed almost entirely of granite, with outcrops of limestone.

From the pass over the spur above Saungta we get another view of the Salween-Taron divide, with a second snow-peak overhanging Cham-p'u-t'ong; but nothing beyond is visible, though the view to the north is extensive. As soon as the rainy region of the Salween is reached at Cham-p'u-t'ong the passes over the western divide become more frequent. At Cham-p'u-t'ong itself the divide is at its narrowest, and the journey from river to river takes three days. In the south, beyond the Nam-tainar-Taron confluence to the west, its lateral extent again increases tremendously, for though the crest of the divide almost overhangs the Salween, the 'Nmaihka is much further to the west; and the divide on that side is dissected by rivers flowing for some distance parallel to the main rivers, owing to the fact that the monsoon is mainly discharged on the west flanks of the divide. The ultimate result will no doubt be that the Taron will cut its way back till it taps the Salween, as the latter will similarly tap the Mekong, thus entirely changing the hydrography of this region. The Salween already flows 1000 or 1500 feet below the level of the Mekong, and the Taron bed is again lower than that of the Salween.

In the Mekong valley itself the rainfall is negligible. Besides the Cham-p'u-t'ong pass to the Taron, there is a second just north of that village, and a third from Bi-bi-li, half a day's journey south. Beyond that comes the route from Yuragan, followed by Prince Henry of Orleans in 1895, and south of that again the main road from Su-ki. Half a day's march south of Su-ki is a sixth pass, and beyond that again near Latsa a seventh, which however takes you over into the Achyang basin. As we go from the arid to the rainy region of the Salween we leave behind all the snow-peaks on the Taron divide; but the passes are snowed up annually for a much longer period in the south.

Between Menkong and Yuragan, a distance of over 100 miles, no European has crossed the divide, though this stretch, containing two fine snow-peaks and concealing perhaps in its northern valleys the nucleus of the dwarf Nungs, is the most interesting part of it. Within these limits also is included the extraordinary change in the Salween valley from a monsoon climate and flora to semi-desert conditions—and it would be intesting to trace the change on the divide itself. The first snow-peak—that above Cham-p'u-t'ong—probably separates two climates and floras on the range, as does K'a-gur-pu on the Mekong-Salween divide; though it will not be so abrupt and sweeping a change as we meet with in the valley. In this connection it is worth noting that the alpine flora of the Salween-Irrawaddi divide in lat. 26° (Hpinaw, north-east frontier) is very similar to that of the Mekong-Salween divide in lat. 28° (Doker-la), while the flora of the Mekong-Salween divide in lat. 29°, north of the

K'a-gur-pu uplift, is very similar to that of the Mekong-Yangtze divide, as already pointed out. It would therefore be very instructive to know whether the alpine flora of the Salween-Irrawaddi divide alters as we go north. If it does not the flora of all three divides must have been derived from a common stock in the north-west, this being the Himalayan line of migration; while the easternmost ranges have passed a Chinese flora along southwards as well. Under present conditions, at any rate, the valleys are physical barriers to plant migration from range to range.

The key to communication between the Salween and Taron might seem to be the Cham-p'u-t'ong Pass, as this leads straight from one river to the other, at the narrowest point. But the Mekong is not so easily reached from Cham-p'u-t'ong, whereas by crossing into Tsa-rung by the Trenge Pass one finds oneself immediately on a good system of mule-roads into China and Tibet; it is, however, this pass which the Tibetans say is so difficult that it takes seven or eight days from river to river, there being three distinct passes to cross. The fact is the Taron is so inaccessible from every direction that any trade route attempting to link up either Assam and China or Burma and Tibet will avoid it as far as possible; in itself it cannot be worth tapping, for its resources, such as they are, must by now be well known to both Tibetans and Chinese. Cross-communication through the Burmese hinterland has evidently never been considered worth while, not even when the Tibetans spread as far south and west as the Hkamti plain. At any rate all the Tibetan roads now run round north of the Irrawaddi sources, avoiding that system as far as possible, while the several routes from the Salween *viâ* the Achyang, Mehk, and Laking valleys to the 'Nmai valley, followed by the Chinese stop there, never attempting to cross the 'Nmai-hka to the Triangle—the tract of country between the 'Nmai and Mali rivers, south of the Hkamti plain.

A few words about the granite gorge of the Salween already referred to. The path is on the left bank at the lower entrance to the gorge, and the precipices which have to be climbed up and down notched logs jammed tightly against the sheer cliffs make it exciting work. At one point a cyclopean granite boulder occupies the middle of the river; in winter it stands 20 feet clear of the water, but in summer it is covered. For a mile here the rapids are practically continuous, and, hemmed in by bare cliffs, the noise is tremendous. Pot-holes and smoothed confluent concavities occur high up on the cliffs, and there is a jumble of big boulders exposed in winter along one bank. The scene here in summer must be extraordinary. A little higher up we cross to the right bank by canoe, and the path continues on that side for a while, then recrosses to the left bank, and so back to the right bank again. Just at the upper entrance to the gorge the river-bed drops several feet, and over this terrific rapid the heavy canoe, big enough to seat fifteen people, has to be carried along the shore. As already stated accidents in winter are common in the granite gorge; once in the river there is small chance of getting out again,

and the water is generally very cold in January, being then almost entirely derived from glaciers and melting snow. On November 9 it was 46°, but by January 4 it had fallen to 38°.

A MEASURE OF CIVILIZATION.

The Distribution of Civilization.— Ellsworth Huntington. Pp. 35. New Haven: Yale University Press. 1915.

IN the autumn of 1913 Prof. Ellsworth Huntington embarked upon an attempt to measure and map the variations in civilization throughout the world. He planned to produce maps with a threefold utility. In the first place, he states, such maps would be intrinsically interesting; secondly, they would yield opportunities to lay more stress upon human character in future geographical, historical, sociological and economic discussions; and thirdly, they would provide a measure of various human qualities whereby the effects of physical environment, race, biological variations, etc., may be tested.

The higher elements of civilization, in his view, include the power of initiative, the capacity for formulating new ideas, the power of self-control, high standards of honesty and morality, the power to lead and control other races, the capacity for disseminating ideas and for carrying new ideas into effect. During the inquiry it became obvious that this list of elements lays insufficient emphasis upon æsthetic characteristics.

An investigation of this kind necessitated the invention of a new method, for Prof. Huntington concluded that the statistics tabulated and published by the several governments were both insufficient and too unequal for the purpose of a world survey. He therefore relied upon the opinions of well-read and experienced investigators. Over two hundred people in twenty-seven countries were asked to co-operate; some of those were geographers, others were ethnologists, travellers, historians; all were held to possess an extensive knowledge of the world, usually through personal experience, but in a few cases through reading. The world was divided into 185 areas, and collaborators were asked to divide these areas into ten groups, so that group 10 should be, in their opinion, notable for the highest development of civilization, and group 1 the lowest. A smaller number of helpers were asked to treat North America by the areas of individual states and provinces in a similar fashion. By means of suggested cautions to collaborators and precautions taken in averaging the results, Prof. Huntington eliminated prejudice, racial bias and technical inaccuracies in his results. Over fifty people made classifications, and over eighty others sent replies of which use could be made. The countries represented by the 54 collaborators were those of Western Europe as well as Russia, Portugal, Spain, Italy, Japan, China, Australia, Canada

levelled and orientated in azimuth. As regards his computations, once the latitude is determined, he is only concerned with time stars, and it is merely a question of shifting his diagram circles east or west.

It is much to be regretted that no actual examples of the work can be given, as they are not available at the moment; but it is hoped that the above notes will at any rate make clear the principles involved in this most interesting and accurate modern method, which abolishes at one stroke the cutting of traverse lines through a forest, with all its laborious measurements, calculations, and tedious delays.

EXPEDITION IN CENTRAL ASIA.*

Sir Aurel Stein, K.C.I.E., D.Sc.

Dated Dalbandin, Seistan-Nushki route, 17 February 1916.

ON 6 July 1915 I left Kashgar after having completed the careful repacking of my eighty heavy camel-loads of antiques for safe transport across the Karakoram to India. The melting snows in the Kun-lun range would not allow the valuable convoy to be started at once; so Rai Bahadur Lal Singh, who was to take care of it on the long and difficult transit, had set out in the meanwhile to complete our topographical labours in Chinese Turkestan by a careful survey of the high snowy mountains which continue the Muztagh-ata range to the headwaters of the Kashgar River.

Before he rejoined me for final instructions I was busy with many urgent tasks in the delightful seclusion of a small fir-clad alp to the south-east of the high Ulugh-art Pass. On July 19 I started across it for my long-planned journey westwards. It was first to take me across the Russian Pamirs to those mountain tracts north of the Oxus which by reason of their ethnic and historical associations and their varied geographical interest have had a special fascination for me ever since my youth. Considering how long I had wished to see this extreme east of ancient Iran I could not feel too grateful to the Imperial Russian Government which had readily granted permission for my journey across ground in parts never visited before by any British traveller.

Of the generous and kind way in which the Russian political authorities were prepared to facilitate my travels I had soon conclusive proof when after a week's rapid journey over the northernmost Chinese Pamirs, I struck the road leading to the Russian Pamirs where it crosses the Trans-Alai range. Here I had the good fortune to meet Colonel I. D. Yagello, holding military and political charge of the Pamir Division, which now includes also Wakhan and Shughnan. I could not have hoped even on

* See *Geographical Journal*, vol. 46, p. 269.

our side of the Hindu Kush for arrangements more complete and effective than those which this distinguished officer had made on my behalf. It was an additional pleasure to find in him an Orientalist scholar greatly interested in these regions and anxious to aid whatever investigations could throw light on their past. I owe it mainly to Colonel Yagello's unfailing aid that I was able to cover so much interesting ground, far more than my original programme had included, within the available time and without a single day's loss.

To study questions of historical geography on the spot was one of the chief objects for which I had planned this journey. So it was a special satisfaction for me to be able to march down the whole of the big Alai valley and to trace additional indications supporting the belief that through it passed the route which the ancient silk traders, like the agents of "Maës the Macedonian," followed from Bactra to "the country of the Seres" or China, as described in a much-discussed record of Marinus of Tyre. Various considerations make it appear to me very probable that the latter's "Stone Tower" must be placed about Daraut-Kurghan, where the route up Kara-tegin, the only direct one between ancient Bactria and Eastern Turkestan practicable throughout for laden camels, emerges upon the Alai.

From there I turned south to strike across the succession of high snowy ranges which separate the headwaters of the Muk-su and the Roshan and Shughnan rivers from the uppermost Oxus. It was a difficult route to follow even with such exceptionally hardy transport animals as Colonel Yagello's orders secured for me from the rare Kirghiz camps encountered. But there was abundant reward in the mass of interesting geographical observations to be gathered. As far as the Tanimaz River our route led past the magnificent glacier-clad range, vaguely known as Sel-tagh and still awaiting accurate survey, which forms the north-western buttress of the Pamirs. Thence I reached the first Iranian-speaking settlement of hill Tajiks or Ghalchas high up on the Bartang or Roshan River.

Our progress up the narrow gorges of the Bartang proved exceptionally trying owing to the results of the great earthquake of 1910. The huge landslips attending it had destroyed what tracks there existed in the valley. It took three days' hard scrambling along spurs almost impassable for load-carrying men and over vast slopes of rock debris to reach the point where the fall of a whole mountain has completely blocked the river and converted the so-called Sarez Pamir into a fine alpine lake over fifteen miles long and still spreading up the valley. It meant another day's stiff and in places risky work before we succeeded in crossing the few miles of precipitous rock slopes above the Yerkht inlet, whence a pass leading to the Yeshil-kol lake could be gained.

Here I found myself on ground of varied geographical interest. On the one hand, with the experience gained at the newly formed big lake fresh before me, it was easy to recognize those topographical features

which clearly point to the Yeshil-kol having derived its existence from a similar cataclysm at some earlier period. On the other hand what I saw on my way up the Alichur Pamir, and subsequently in the main Shughnan valley below it, clearly showed the advantages which this route ever since Kao Hsien-chi's memorable Pamir campaign of 749 A.D. had offered for Chinese expansion to the Upper Oxus and Badakhshan.

After crossing the Bash-gumbaz, our fourth pass over 15,000 feet since the Alai, I descended to the glittering expanse of Lake Victoria and reached the Great Pamir branch of the Oxus. It was a delightful sensation to find myself on ground closely associated with the memories of those great travellers, Hsuan-Tsang, the famous Chinese pilgrim, Marco Polo, and Wood.

My subsequent journey down the Oxus was attended by an abundant harvest of observations on the historical topography, archæology, and ethnography of Wakhan which in early times had formed an important thoroughfare between Bactria, India and the Central Asian territories of China. The exact survey of a series of ruined strongholds, some of considerable extent, brought to light numerous features of archæological interest. That these hill fastnesses date back to pre-Muhammadan times and to an epoch when this portion of the Oxus valley contained a far denser population than at present, is certain. Some architectural details suggested a period corresponding to late Indo-Scythian or early Sassanian domination.

In spite of the high elevation, from 8000 to over 10,000 feet above sea-level, the cultivated portion of Wakhan still presented a verdant appearance, doubly welcome after the bleak Pamirs. The effect was heightened by splendid views of the grand Hindu Kush chain to the south. So I was glad that plentiful antiquarian, anthropometric, and philological work kept me busy in Wakhan during the first half of September. Then, passing down the Oxus below its great northward bend, I visited Colonel Yagello's headquarters at Kharuk and passed into the Shughnan valleys. They figure often in Chinese and early Muhammadan records of the Middle Oxus region, and their secluded character has helped to preserve a great deal of old-world inheritance in ethnic types, local customs, domestic architecture, etc.

From the Ghund Valley I crossed into Roshan by the difficult glacier pass of Shitam, over 16,000 feet high. From the ice-crowned watershed there opened a glorious vista over the rolling uplands of Badakhshan, a region towards which my eyes have been turned for many years—and which still remains inaccessible. The narrow gloomy gorges of the Roshan River proved even more troublesome than the pass by which we had reached them, and after two days' scramble past precipices by steep rock ledges and rough galleries it was a relief to emerge once more in the less-confined valley of the Oxus. Roshan, just as it is the least accessible of all the side valleys of the Oxus, seems also to have preserved the *homo*

alpinus type of the Ghalchas in its greatest purity. I was greatly struck by the remarkably fair looks of the whole population.

By crossing the glacier pass of Adude I made next my way into the Yazghulam and Vanj valleys of Darwaz, where the territory of the Amir of Bokhara was entered. Here too the recommendation of the Russian political authorities had assured me all possible help and attention. The gradual change in the physical appearance, ways of living, etc., of the people as we passed further and further north bore testimony to the historically attested conquest of Turk tribes. The Sitargh Pass, with its badly crevassed glacier, was crossed just in time before the first heavy snowfall closed it, and finally we gained by the Gardan-i-Raftar Pass the main valley of Kara-tegin.

In Kara-tegin I found myself once more on the line of the ancient silk trade route to Bactria. It was interesting to note here how the old Kirghiz invaders are being slowly ousted again from the land by a steady reflux of Tajik settlers. A succession of rapid marches then carried me through the open and remarkably fertile valleys drained by the rivers of Kafirnihan and Surkhan to the confines of ancient Sogdiana about Shahr-i-sabz. Finally, on October 22 I reached Samarkand and the railway. My journey since leaving the Kashgar Mountains had lasted just over three months, and within these we had covered on horseback and on foot a total distance of 1700 miles.

After a few days spent at Samarkand and Bokhara, where the great monument of the Mogul period claimed visits, I travelled by the Trans-Caspian railway to Askhabad *en route* for a new field of work on Persian soil. By November 4 I reached Meshed, where Colonel T. W. Haig, C.M.G., H.B.M.'s Consul-General for Khorasan, offered me the kindest welcome and the chance of a much-needed short rest. There I learned by wire the gratifying news that my 183 cases with antiques had safely arrived in Kashmir.

Seistan was my goal for the winter's work, and in order to reach it I chose a route which, leading off the main roads, gave opportunities for useful supplementary survey work, while it is also the most direct. Starting from Meshed on November 11 we travelled by little-frequented hill-tracks to Rui-khaf, and thence south in an almost straight line parallel to the Perso-Afghan border, until we struck the high-road at Bandan, two marches from the Seistan "capital." The total distance of over 500 miles was covered in twenty-one days, and with the assistance of my energetic young surveyor, Afrazgul Khan, a careful plane-table survey on the scale of 4 miles to the inch was carried over the whole ground. The disturbed conditions of Persia due to the war made themselves felt to some extent also on the Khorasan side. But my journey passed off without awkward encounters.

Since my student days I had been drawn to Seistan by the hope of finding among its numerous ruined sites remains of the periods when

ancient *Sakastana* served as an outpost of Iran and the Hellenistic Near East towards Buddhist India. My explorations in the Tarim basin provided a strong additional reason, for the striking analogy presented by various physical features of the terminal basin of the Helmand River was likely to throw light on more than one geographical question connected with the dried-up delta round Lop-nor. In both directions my hopes have been fully justified by the results of my Seistan work. Various circumstances imposed upon it the character of a reconnaissance. Yet even thus it could not have been carried through successfully within the available time had not Major F. B. Prideaux, C.I.E., H.B.M.'s Consul in Seistan and Kaian, given me the kindest and most effective help and the benefit of his wide local experience. I derived most useful aid, too, from the excellent topographical surveys which had been effected under the direction of Mr. G. P. Tate, of the Survey of India, in connection with Sir Henry McMahon's Seistan Mission of 1902–05.

My archæological search was rewarded at the very start by an important discovery. The extensive ruins situated on the slopes of the Koh-i-Khwaja hill, which rises as a conspicuous landmark above the Hamuns or terminal marshes of the Helmand, proved to be the remains of a large Buddhist sanctuary, the first ever traced on Iranian soil. Their location at a site which to this day has retained special sanctity for the Muhammadans of Seistan once again strikingly illustrates the continuity of local worship. Hidden behind later masonry, there came to light remarkable fresco remains which undoubtedly date back to Sassanian times. Further search in a gallery below the main temple revealed wall paintings of a distinctly Hellenic type. These pictorial relics illustrate for the first time *in situ* the Iranian link of the chain which connects the Græco-Buddhist art of the extreme north-west of India with the Buddhist art of Central Asia and the Far East. The architectural features of the ruins were also of great interest, reflecting that connection with equal clearness.

Remains of much earlier times were disclosed by my survey of the desert to the south. There, in an area once watered by an abandoned old branch of the Helmand, excessive wind-erosion acting on alluvial clay had produced conditions exactly resembling those with which I had become so familiar in the dried-up delta north of Lop-nor. The scouring by wind-driven sand had here lowered the original ground level to varying depths, down to 20 feet or more, except where the surface had been protected by hard debris of some kind. The erosion terraces thus left rising island-like above the bare plain were always found thickly covered with prehistoric remains, consisting of potsherds, often decorated, and stone implements mainly of the Neolithic period, but in places including also relics of the Bronze Age. Here a rich and interesting archæological harvest could be picked up literally on the surface.

In a portion of this desert area Muhammadan ruins attested a temporary return of the fertilizing river water during a relatively recent period.

But of far greater interest was the unexpected discovery of a close line of ancient watch stations stretching right across the desert from the southernmost Hamun in the direction of the salt basin of the Gaud-i-Zirreh. The experience gained during my explorations along the ancient Chinese wall discovered in 1907 in the desert of Tun-huang helped me greatly in tracing this Seistan *Limes*. The fortified frontier posts, solidly built after a uniform pattern, were found always to occupy erosion terraces, chosen no doubt for the sake of increased command of ground, at distances from half to about one and a half miles apart. The position of sectional headquarters could also be identified.

A variety of archæological finds and observations points to the early centuries of our era as the time when this ancient border-line was established. It was intended to safeguard the cultivated portion of the Helmand delta from raids of nomadic tribes from the south. The analogy presented to the ancient Chinese frontier line of Kan-su constructed *circ.* 100 B.C. against Hun raids from Turkestan is certainly very curious. Would one be justified to regard this fortified Seistan border as a link between that old "Chinese wall" in the desert and the *Limes* lines by which Imperial Rome protected its marshes in the Near East and elsewhere? Only future researches could give a safe answer.

By the new year (1916) I returned to the inhabited portion of Persian Seistan, and was kept busy during the next few weeks with the examination of the numerous ruins surviving there. The physical conditions of the present Helmand delta account for the fact that almost all proved of mediæval Muhammadan origin or even more recent. At two sites, however, well above the level of irrigation or periodic inundation, I discovered definite archæological evidence of ancient occupations, including pottery inscribed in early Aramaic characters.

Permission to visit the Afghan portion of Seistan, where Sir Henry McMahon's Mission had found a large number of ruins awaiting expert examination, could not be secured. So after using a final stay under Major Prideaux's hospitable roof for the collection of anthropometric materials, I returned to the desert south, and completed my survey of the ancient *Limes* by some excavations which disclosed interesting details as to the internal arrangements of those ruined watch-stations and the life once led there.

At the beginning of February I set out for the return journey to India by the Seistan-Nushki trade route which the zeal of Captain (now Colonel) F. Webb Ware, C.I.E., of the Indian Political Department, had first pioneered through the desert some twenty years ago. To me this desert journey of over 400 miles has its special interest; for it illustrates to perfection the conditions once prevailing on that ancient route through the Lop desert which was opened about 110 B.C. for the expansion of Chinese trade and political influence westwards, and which two years ago I succeeded in tracking through waterless wastes after sixteen centuries of

abandonment. In geographical and historical aspects it furnishes a most instructive analogy, even though the physical difficulties encountered on that ancient Lou-lan route must have been far greater than those successfully overcome on this its modern counterpart.

In a few days I hope to reach Nushki, whence the railway is to take me for brief visits to Delhi, Dehra Dun, and Lahore in connection with future labours on the results of my expedition now completed. It has lasted two years and seven months, as I started from my Kashmir base in July 1913.

NOTES ON THE ALTO RIO BRANCO, NORTH AMAZONAS.

R. H. Blake.

THE main Rio Branco discharges through its several mouths into the Rio Negro in the neighbourhood of Carvoeira and Moura, the geographical co-ordinates of the former place being lat. 1° 24′ S. and long. 18° 49′ west of the meridian of Rio de Janeiro, which is 43° 10′ 21″ west of Greenwich. • On ascending the river one threads through such a maze of islands and islets that it is extremely difficult to know which is or is not the mainland; but once clear of the obstructed area it is seen that the river has a width of roughly 2 kilometres and an approximate current during the rainy season of 4 knots per hour. As its name denotes, it is a white-water river, and carries with it much earthy sediment, especially when the flood level is falling and the waters which have spread themselves over the igapô (forest bordering the river which is flooded during high water) and campos (savannahs) are receding into the main river, taking with them a considerable quantity of soil and humus.

Where the Rio Branco discharges into the dark waters of the Rio Negro it is possible to trace its course for some distance, as is the case lower down, where the division of the waters of the Negro and Solimões is easily noted. Very few houses are met with, and these are invariably the abode of seringueiros (rubber tappers), and are of the ordinary wattle and daub construction, with roofs formed of the leaves of the burity (*Mauritia vinifera*) and palmito (*Euterpe edulis*) palms, which abound. The former is known as "mirity" locally. The surrounding country is entirely composed of forest of a typically Amazonian nature—a tangle of dense undergrowth and stout creepers under fair-sized trees—and in many places, during the rains, the igapô extends back many miles from the river, and has during the dry season the broken lumpy surface known as "torrão." Rubber trees (*Hevea brasiliensis*) and the Brazil nut tree (*Bertholletia excelsa*) abound, and of the numerous hardwoods the most sought for ordinary purposes are the pao rainha for general construction and the itauba

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.

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

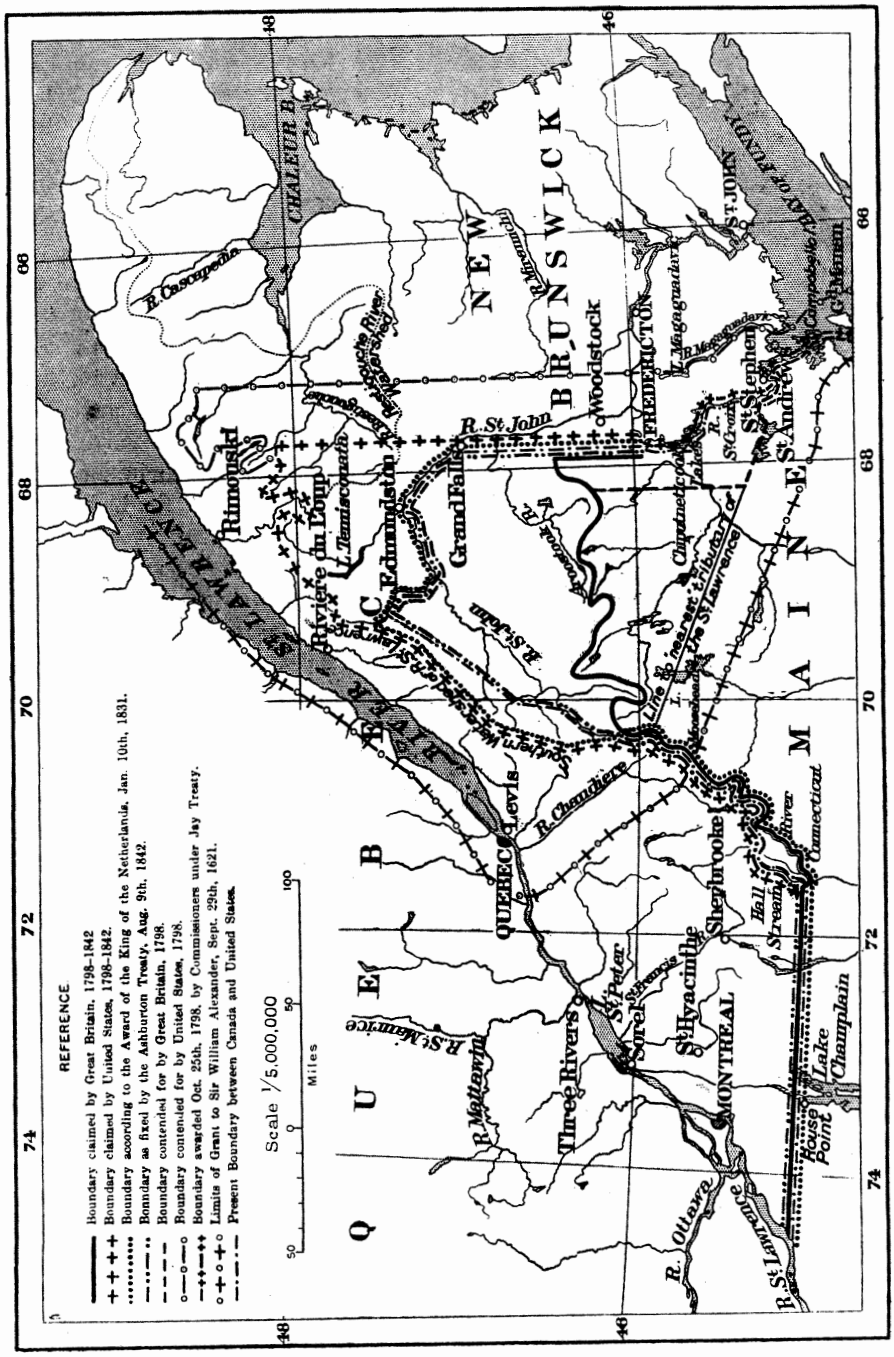
expansion and trespass into the neighbour's territory and thus destroy the germs of frontier dispute—such boundaries indeed as have been found practically necessary, is rather too large a question to tackle in one evening's paper. I shall confine myself to-night to a reference to some of the geographical 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.

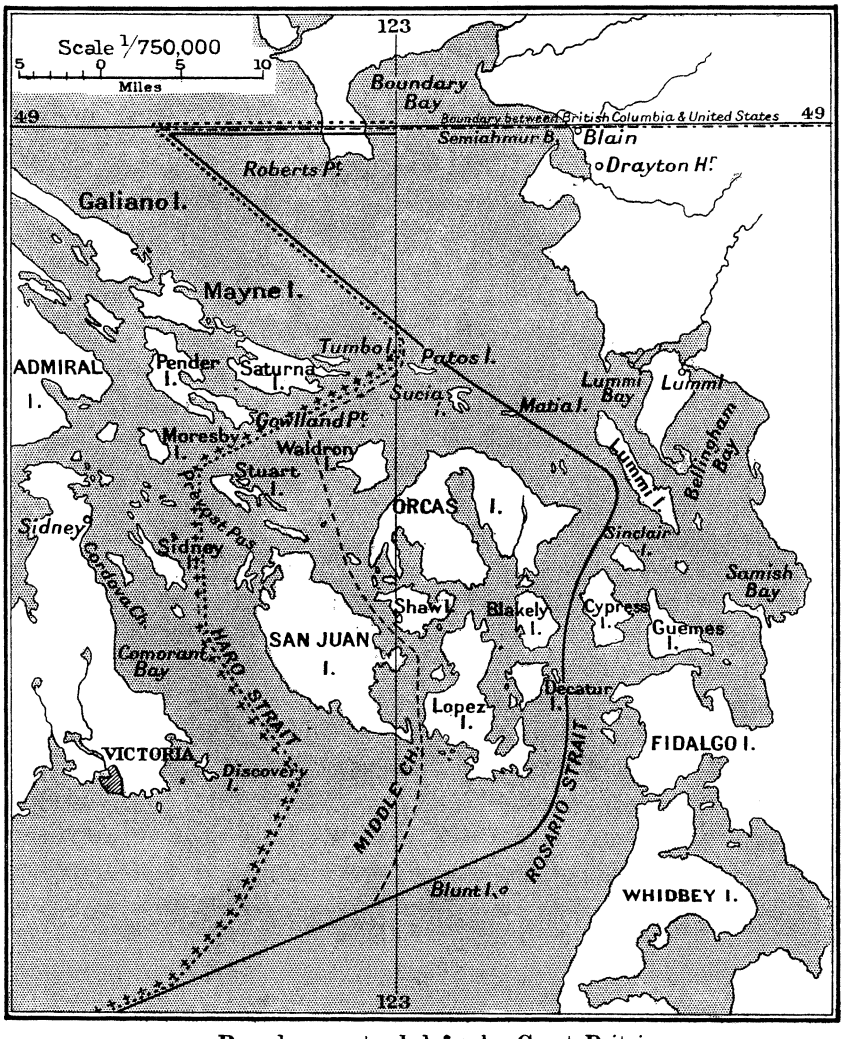


smaller class of instruments and wireless telegraphy and lead to rapid progress in advance of strict geodetic measurements, are quite sufficient to enable us to spread out our map system on comparatively small scales of work over the vast areas that are of primary interest to the commercial, military, 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.

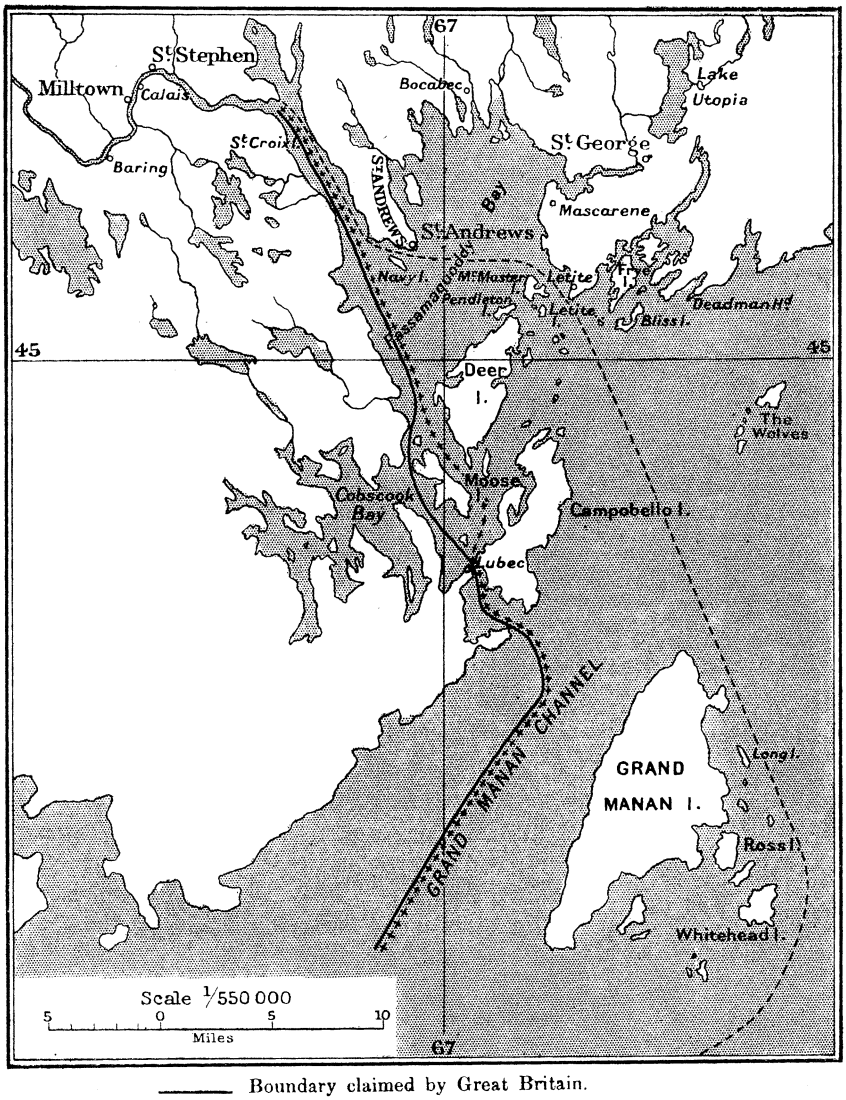
Some very notable instances have occurred lately in connection with boundary settlements in Central and Southern Africa which illustrate the

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 Cataraquy; 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 coast-land 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 ot 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.

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