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SIR AUREL STEIN'S EXPEDITION IN CENTRAL ASIA.*

AFTER a short and busy stay at Kashgar, where the ever effective help of my old friend and host, Sir George Macartney, K.C.I.E., our Consul-General for Chinese Turkestan, greatly facilitated the organization of my caravan. I started on October 9 for my first winter's work in the desert. Its main goal was the region around Lop-nor, at the other extremity of the Tarim basin, and various considerations obliged me to travel there *viâ* Khotan. Much of the long journey was bound to take me over ground already familiar from my previous expeditions, and this made me doubly eager to use whatever chance of new routes there was on my way to Khotan.

With this object I first moved to Maralbashi along the foot of the southernmost range of the Tien-shan, which in this portion had hitherto remained largely unsurveyed. Indications previously collected pointed to the existence of an old route, now but vaguely remembered in local lore, which during early periods of Chinese domination had led along the foot of these barren mountains and considerably to the north of the present high road connecting Kashgar with Aksu. The accurate survey now effected fully confirmed that tradition and revealed a succession of ruined sites, going back to the pre-Muhammadan epoch and echeloned along a line of some 160 miles. Most of this desert ground is now wholly devoid of water, and this fact, along with other physical observations of interest, furnishes distinct proof of desiccation within historical times.

After surveying some ruined Buddhist shrines in the vicinity of Maralbashi, I wished to make my way to the desert hills of the Mazar-tagh on the lower Khotan river. Our surveys of 1908 had shown reason for the belief that in geological structure they formed part of an ancient range which started at an angle from the outermost Tien-shan and once extended across the Taklamakan in a south-easterly direction. After surveying the bold island-like hills into which erosion, mainly æolian, has broken up this range east of Maralbashi, we reached the southernmost of them, known as Chöktagh. From a desert lake near this, Hedin, in 1896, had started eastward on that memorable journey which ended with the destruction of his caravan and his own narrow escape.

Following a south-easterly course we forced our way for three trying marches across the mighty ridges of sand which, closely packed and soon reaching 200–300 feet in height, blocked the route in the intended direction. It was by far the most forbidding ground I had ever encountered in the Taklamakan. Careful levels taken along our track showed an aggregate ascent of some 400 feet over a single mile's distance, with corresponding descents even more trying to the camels. When the hired camels intended as a "supporting party" showed signs of exhaustion I

* Communication from Sir Aurel Stein, dated Camp Ch'ien-fu-dung, April 7, 1914. See *Geographical Journal*, vol. **42**, p. 540.

was forced to turn northward in order to avoid needless sacrifice of our own brave camels which were to be the mainstay of our transport for the winter's explorations.

Two interesting discoveries had rewarded the effort. Again and again we came between the high dunes upon patches covered with minute but easily recognizable rock fragments of the wind-eroded hill range, once extending right through to the Khotan river. Elsewhere, fully 30 miles from the Tarim, a small area of eroded ground displayed abundant remains of the stone age, proving occupation by a palæolithic settlement of what is now absolutely lifeless desert.

Crossing the Tarim and subsequently taking a short cut through the desert, we gained the delta of the Khotan river by a route hitherto unsurveyed. It showed us the great change which has recently taken place in the river's terminal course. Then I hurried south to the Mazar-tagh hill, where interesting archæological results rewarded resumed spadework at the ruined fort. Apart from additional written records of the Tibetan period, there came to light remains of a Buddhist shrine immediately below the alleged Muhammadan saints' tombs, which accounnt for the present name of the hill. This discovery supplies a particularly striking instance of that continuity of local worship, so important a feature in the religious history of Central Asia.

Only a brief halt was possible at Khotan towards the close of November, and I used it to gather such antiques as local friends in my old haunts had collected from the site of the ancient Khotan capital and from "treasure-seeking" operations in the desert. Close on 700 miles marching distance still separated me from Lop-nor, and I knew well the importance of reaching it in time while the severe winter of the desert lasted. But I could not forego altogether the opportunities for archæological work which familiar sites *en route* still held out. Thus by rapid excavation amongst the tamarisk-covered sandcones in the vicinity of Hsüan-tsang's Pi-mo (Marco Polo's Pein), I recovered some interesting fresco remains of a Buddhist shrine.

Then, hurrying on to Niya, I revisited the important sand-buried settlement northward, abandoned to the desert in the third century A.D. It did not disappoint me now either. A close search of previously unexplored ground to the south revealed more ruined dwellings of the same early period. Digging with a large number of men, we recovered numerous documents on wood—written in the Indian language and script which prevailed in official use from Khotan to Lop-nor during the first centuries of our era—furniture, household implements, etc. Particularly curious was the discovery among the dunes of a large and remarkably well-preserved dead orchard, in which the arrangements for the growing of the various fruit trees, the trellis-carried vines, etc., could be studied in almost uncanny clearness. It was hard to tear myself away from this modest sand-buried Pompeii after a week's incessant work.

Its extension to new ground was greatly facilitated here, as elsewhere, by the devoted energy of the two Indian assistants secured for this journey, Naik Shams Din, a capable N.C.O. of the First (K.G.O.) Sappers and Miners, and Mian Afraz Gul, of the Khyber Rifles, who, after having been trained as a military surveyor, had gained practical experience during my recent archæological explorations on the Indian north-west frontier.

My renewed visit to this ground, after seven years' interval, gave opportunities also for observations of direct geographical interest, concerning changes in the terminal cause of the dying Niya river, etc. Among such, I may mention the instructive fact that cultivation in the small colony established at the latter was found to have recently receded, not from want of water, but, on the contrary, owing to a succession of ample summer floods which destroyed the canal-head, and with which the locally available labour could not cope.

After leaving the Niya site I struck a new route through unknown desert to the Endere river. Exceptionally clear weather compensated us for the bitter cold of December, and allowed the snow-clad main Kun-lun range south to be sighted day after day. With the help of the numerous peaks there previously triangulated, Surveyor Muhammad Yakub Khan could map our route to Charchan, and thence towards Lop far more accurately than had been possible before.

Already, in September, I had detached R. B. Lal Singh ahead, in order that he might resume triangulation along the main Kun-lun range, from where, in 1906, we had been obliged to stop it. With his often-proved zeal, my indefatigable old travel companion had pushed on, and started triangulation from near Kapa by the middle of October. In spite of the hardships implied by work at great elevations and on ground devoid of all resources, he succeeded in extending his system of triangles eastward for over five degrees of longitude before excessive cold and heavy snowfall obliged him to stop it. Thus a net connected with the Indian Trigonometrical Survey has now been carried beyond the actual Lop-nor. Lal Singh then continued work with the plane-table towards Tun-huang, taking special care to obtain many height observations by mercurial barometer, etc., along his route through the snow-covered mountains. It was a great relief when he safely rejoined me soon after my own arrival at Charklik on January 8.

It was at this small place, the only settlement of any importance in the Lop region, that I had to secure the supplies, labour, and extra transport needed by our several parties for the next two and a half months of exploration work in the desert between Lop-nor and Tun-huang. The difficulties of the task were greatly increased by local disturbances which had cost the life of the Chinese district magistrate shortly before my arrival. Tungan troops from Kara-shahr had repressed this outbreak of Chinese "revolutionaries." But their passage nearly exhausted the slender resources of Charklik, and, in the absence of any Chinese civil authority,

little effective help could be expected from the easy-going Lopliks. It thus cost the anxious efforts of weeks to raise what was needed in food for men and beasts, together with the additional camels upon which we should have to depend for the transport of water, *recte* ice.

Fortunately, I was able to use my six days' stay at Charklik for profitable archæological labour. While executions of captured rebels, etc., kept the little oasis in unwonted animation, I managed to clear two small sites in the vicinity which had previously escaped me. There ruins of Buddhist shrines yielded small but interesting remains of Sanscrit manuscripts on birchbark, palm-leaf, and silk, suggesting import from India by the direct route which still leads across the Tibetan plateaus to the south.

I then moved eastwards to Miran, where, in 1907, I had excavated important ruins, marking the site of the earliest capital of the "kingdom of Shan-shan or Lou-lan." In two of its Buddhist shrines there had then come to light wall paintings of great artistic interest, showing closest approach to the Græco-Buddhist art of Gandhara and some almost Hellenistic in character. Owing to want of time and subsequently to the tragic fate which struck my old assistant Naik Ram Singh with blindness at this very place, I had then been able to remove only one of these remarkable fresco series. The recovery of what was left proved a delicate task of considerable technical difficulty, and the icy blasts to which we were almost continuously exposed made the work still more trying. But in the end it was safely accomplished. I also succeeded in recovering sculptural remains of interest from the shattered ruins of two Buddhist shrines of somewhat later date.

Simultaneously preparations were pushed on for the explorations which our several parties were to make into the waterless desert north and north-east of Lop-nor. On January 23, I started R. B. Lal Singh northward for an exact survey of the ancient river-bed and its branches by which the waters of the Konche-darya once reached the area, now all desert, south of the Kuruk-tagh, where Hedin, in 1900, had made his important discovery of the ruins of the "Lou-lan site." Eight days later, I set out myself into the desert north of the terminal lagoons of the Tarim, while Surveyor Muhammad Yakub Khan was sent off to work at the eastern end of the great salt-encrusted lake-bed marking the ancient Lop-nor. My own party included a relatively large number of labourers for intended excavations. What with big loads of ice sufficient to assure minimum allowances of water for thirty-five people during at least one month, and with food supplies to last my own men for two months, I found the thirty camels raised by no means too many. Of course, everybody had to walk.

My immediate goal was a large ruined fort which Tokhta Akhun, my old Loplik follower, had first come upon, apparently in 1910, when returning from the visit which Mr. Tachibana then had paid to the "Lou-lan site." We find it situated in wind-eroded desert, four marches

from the terminal Tarim course. The clearing of the substantial dwellings within furnished numerous finds of coins, architectural wood carvings, implements, etc., which clearly showed that the period of occupation was the same as that of the "Lou-lan site," closing early in the fourth century A.D. The well-marked dry river course near which the fort rises, clearly revealed itself by its direction as a southern branch of the ancient "Kuruk-darya," once carrying water to the "Lou-lan site."

Following its course we subsequently discovered a second and smaller fort, and north of this an extensive settlement. Its dwellings had all suffered badly through wind erosion. But their remains and the refuse heaps near them furnished numerous ancient records on wood and paper in Chinese and early Indian scripts as well as in early Sogdian, besides many interesting and well-preserved articles of household use, personal equipment, etc. Their evidence proves that this settlement, too, was abandoned about the beginning of the fourth century A.D.

The antiquarian finds and physical observations here made throw fresh light on various questions of the hydrography and early occupation of this part of the Lop basin during historical times and those immediately preceding them. Finds of neolithic stone implements abounded near these ruins and on most of the wind-eroded ground which we subsequently crossed to the "Lou-lan site." During two long marches a succession of ancient river-beds was met, all clearly recognizable by their direction as having branched off from the "dry river," skirting the foot of the Kuruk-tagh. A considerable delta existed here during early historical times, and our surveys have shown how far it extended to the south and south-east.

The old Chinese station marked by the chief ruins of the "Lou-lan site" served as our base camp for the reconnaissances pushed into the unknown desert to the east and north-east. My hope of finding more ruins near what I conjectured to have been the line of the earliest Chinese route connecting the extreme west of Kan-su with the Tarim basin was not disappointed. We discovered quite a series of small ruined sites, leaving no doubt as to the direction followed by that route within the once inhabited area. Their remains strikingly illustrated both the conditions of life prevailing among the local population during the first centuries of our era and the character and importance of the traffic which passed here since Chinese expansion westwards, political and commercial, commenced about 120 B.C.

It is impossible at present to go into details. But I may mention at least that among the antiquities brought to light, relics abounded of that silk trade which we know to have been a chief factor in opening this earliest route for China's direct intercourse with Central Asia and the distant West. These fabrics show the perfection reached by decorative textile art in China during Han times.

Of special importance was the discovery of a large well-built fort

which had served as a *point d'appui* for Chinese missions and troops, where they first reached Lou-lan territory after crossing the desert north of the salt-encrusted dry lake-bed. The constructive features of its walls, built with layers of clay and carefully secured reed fascines and remarkably well preserved after two thousand years' exposure, agreed in every detail with those observed in the westernmost extension of the Chinese Great Wall, with which my explorations of 1907 in the desert near Tun-huang had rendered me so familiar. There could be no doubt that it dated like the Tun-huang *Limes* itself, from the first military advance into the Tarim basin, about 104 B.C., and finds of Chinese records on wood have confirmed this.

I had thus secured a safe starting-point for the difficult task still before us, that of tracing the line of that famous ancient route through the forbidding desert eastwards. Incessant hard work under the trying conditions of the waterless desert had exhausted our Loplik labourers, and when the last digging had been done under the blasts of the season's initial sandstorm I was glad to let them return to the world of the living. Lal Singh had safely joined me after accomplishing his tasks in the west. Together we moved then north to the Kuruk-tagh by a new route in order to let our hard-tried camels have a few days' rest with water and grazing at the salt springs of Altmish-bulak. Then we separated for our respective tasks. While Lal Singh was to survey the unknown north-east shores of the salt-encrusted dry lake-bed and the barren hills of the Kuruk-tagh encircling them, I proposed to track the ancient route right through to where it was likely to have diverged from the desert track still used south of the great dried-up lake-bed.

It was a task after my own taste, but one attended by serious difficulties and by risks too. No water could be hoped for before striking the Tun-huang route, a matter of some ten days' hard marching for the heavily laden camels—fuel besides ice had to be carried. There was a limit to the endurance of our hardy camels, and it was impossible to foresee what physical obstacles might delay us.

They soon presented themselves when we had to make our way south through and across a perfect maze of steep clay terraces of unusual height, all carved by wind erosion. Having regained the vicinity of the early Chinese stronghold previously mentioned, we soon reached the extreme eastern limit of the area to which the waters of the Kuruk-darya had once carried life. Beyond there were no ruins to guide us. The desert eastwards was already in ancient times as devoid of plant or animal life of any sort as it now is. We were passing from the land of the dead into ground that never knew life—except on the route to be tracked.

It would be too long to relate here how the task was accomplished. Indications deduced from topographical and archæological observations afforded some clue from the start, and kindly Chance helped with

guidance such as I could scarcely have hoped. Again and again finds of coins, small metal objects and the like, assured us that we were still near the ancient track by which troops and traders had toiled for centuries through this lifeless wilderness of clay and salt. With the exception of one day spent in crossing a bay of the ancient lake bed with its hard crumpled-up salt crust, such finds cropped up on every one of the eight long marches which brought us from the extreme edge of the dead delta to the well of Kum-kuduk.

There were thrilling incidents, such as when for a short distance we found the ancient track plainly marked by hundreds of early Chinese copper coins and unused bronze arrowheads strewing the ground. They had evidently dropped unobserved from some convoy of stores in Han times, perhaps moving at night time. Notwithstanding the fatigues and anxieties caused by the often very difficult ground it was a fascinating time of work. How those patient old Chinese organizers of transport maintained traffic along this route without water, fuel, or grazing, is an interesting problem.

Relief came when we had reached, without loss, the first scanty vegetation where the ancient track, here in places still plainly visible in the salt-encrusted ground, skirts the foot of the cliffs overlooking the extreme eastern bay of the dry lake bed. Two days later our parties reunited at Kum-kuduk. A successfully arranged concentration brought there also our heavy baggage from Miran, and allowed us to move on towards Tun-huang without loss of time. Leaving the caravan track, we then continued to explore the ground close to the foot of the Kuruk-tagh, where the ancient route had passed, and further east the geographically very interesting desert area around the present terminal basin of the Su-lo Ho river. There I picked up Surveyor Muhammad Yakub Khan, who had carried a carefully measured line of levels all the way up from the ancient dry lake-bed. Its result, along with other observations, has confirmed the belief that the waters of the Su-lo Ho at a relatively recent period drained into the Lop-nor basin. Percolating the sandy soil at the foot of the Kuru-tagh, within a few feet from the surface, they reach it in fact even now.

Arrived at the western end of the ancient "Great Wall," successfully explored in 1907, I could clear up some supplementary archæological questions. Then, near Lake Khara-nor, I resumed the detailed exploration of the Tun-huang *Limes* where circumstances had before obliged me to leave a gap in my survey. During the last week before my arrival at Tun-huang by the end of March, we succeeded in searching all the ruined watch stations along this remaining portion of the line. Ample finds of Chinese records on wood, and of other interesting relics going back to Han times, rewarded the clearing. A short halt at Tun-huang refreshed men and beasts, and now, after a renewed visit to the "Halls of the Thousand Buddhas," I am starting to move into Kan-su for the work of the spring.

Wilde on his return in September, 1674, are noted in the 'Catalogue of Pepysian Manuscripts' (vol. 2); and one of these contains a reference to some "draughts" which the captain was finishing for presentation to the Duke of York. Here is another proof of his predilection for such work, and, bearing in mind that his ship, as shown by the correspondence, had certainly been at Cadiz, we may conclude that the charts of that and other Spanish ports appearing in *Additional Manuscript* 15,737, are based on drawings made during that voyage. In January, 1678, King Charles gave Wilde the command of the *Mary Rose;* and three months later he was promoted to the *St. Michael.* We then hear nothing of him until June, 1683, when he was made captain of the *Oxford.* This vessel formed part of the fleet sent out under Lord Dartmouth to arrange for the abandonment of Tangier, and among the Dartmouth Papers is a long report on the celebrated Mole, signed amongst others by Wilde. This is our last trace of him; but there could not in any case be much more to record, for in the list of naval officers given in vol. 1 (p. 316) of the 'Catalogue of Pepysian Manuscripts,' he is shown as dead in 1688.

The history of the volume of charts, after it left Wilde's hands, cannot now be fully elucidated. On fo. 7, however, will be found a pencil note signed A. D.—the well-known monogram of Alexander Dalrymple, Hydrographer to the Admiralty; while at the end is a further note in the same handwriting ("9 April, 1796, Simcoe, 18*s.*"), showing the date when Dalrymple purchased the volume, the seller, and the price given for it. He had already utilized in his well-known charts two of the sketches in Wilde's 1650–52 journal; and he now included in the same series two from his new acquisition (though apparently without recognizing the authorship of the latter). These were the charts of the north-west coast of Madagascar (issued in 1798) and that of the Straits of Singapore (1805), and they were described in the one case as "from an old English MS." and in the other as "from an old book of English MSS." Evidently Dalrymple left the volume behind him at the Admiralty, for (as a note in the front informs us) it was presented by the Lords of the Admiralty to the British Museum in January, 1844.

THE COALFIELDS OF INDIA.*

Extent of the Coalbearing Rocks.—In 1873, Mr. T. W. H. Hughes† put forward the following estimate of the extent of the known coal-bearing rocks of India:—

* Abstracted from 'The Coalfields of India.' By the late Prof. V. Ball, C.B., LL.D., F.R.S. Entirely revised and largely re-written by R. R. Simpson, M.SC., Inspector of Mines, formerly Mining Specialist to the Geological Survey of India. *Memoirs of the Geological Survey of India*, vol. **41**, 1913.

† *Rec., Geol. Surv. India*, vol. **6**, 1873.

Name of area.	Square miles.
Godavari and its affluents	11,000
Son	8,000
Sarguja or Gangpur	4,500
Assam	3,000
Narbada and its affluents	3,500
Damuda	2,000
Rajmahal	300
Unsurveyed and uncomputed	2,700
	35,000

This estimate is probably somewhat in excess of the truth, but the additional evidence to date does not permit of a much closer approximation. Over a considerable portion of the area the coal-bearing rocks are covered by younger deposits, and must lie at unworkable depths.

Number of Coalfields.—Although coal-mining has been in operation in India for more than a century, and although there has been a steady increase in production and consumption, which has been especially noticeable in the last decade, still the development of the coal resources of the country is as yet in an imperfect condition. Of the numerous coalfields of proved value in India, eighteen are actually being worked, but only seven are of any considerable importance, whilst 89 per cent. of the total output is produced in Raniganj and Jharia fields. The reason for this state of things is not far to seek. Most of the coalfields are too remote from the ports and centres of manufacturing industry to render it possible for their produce to be carried to places where it would have to compete with fuel from the premier coalfields of Bengal, which fields, from their strategic position within easy reach of the coast, practically command the Middle Eastern market. That a lively spirit of enterprise is abroad is, however, evident from the fact that coal-prospecting operations are in progress in nearly a dozen separate coalfields.

The following list gives the names of those coalfields which are being worked to any extent at the present day :—

Assam: Makum. *Baluchistan:* Khost, Sharigh, etc., Sor Range and Mach. *Bihar and Orissa:* Jharia, Daltonganj, Giridih. *Central Provinces:* Rampur, Ballāpur, Mohpani, Chhindwara, Worora. *Central India:* Umaria. *Hyderabad:* Singareni. *Punjab:* Dandot. *Rajputana:* Palana.

Stratigraphical Arrangement.—The coal-seams of India occur in deposits younger than those in which the principal coalfields of Europe are found. With one or two unimportant exceptions, the peninsular fields are confined to the great Gondwana (Permo-Triassic) system, considered to have been almost entirely deposited in fresh water, and probably by rivers. As a rule, they are found in basin-shaped depressions in the older formations, and frequently coincide with the existing river-valleys. On the west these areas appear to be basins of original deposition; but on the east abrupt faulting on the south shows they are probably preserved through being sunk.

Talchirs.—The lowest member of the system, the Talchir beds, consists in general of fine silty shales and fine soft sandstones. A thin coal-seam occurs in the Jhilmilli coalfield in Sarguja, but, as a rule, these beds do not contain coal-seams. Towards the base of the group the frequent occurrence of a remarkable boulder-bed containing striated pebbles points to the existence of glacial conditions in early Gondwana times. It may be remarked that the occurrence of a similar bed (Dwyka conglomerate) in an analogous position

in the coalfields of South Africa is one of a number of facts pointing to the similarity in age of the coal-bearing rocks of both countries.

Karharbari Beds.—The rocks of the Karharbari stage consist of white, grey, or brown felspathic sandstones, grits, and conglomerates, with coal-seams; a little shale is associated with the latter. The coal is dull-black, and fairly uniform in structure. It is a good locomotive fuel. In the next, or Damuda, series, with the doubtful exception of the Giridih field, occur the workable coal-seams of peninsular India. It is divided into three stages, which are known in Bengal as the Barakar stage, the Ironstone shales, and the Raniganj beds. Only the first and last of these are coal-bearing.

The Barakar Stage.—The Barakars attain their maximum development in the Jharia coalfield, where they are 3300 feet in thickness. They are composed of sandstones, conglomerates, shales, and coal. The coals of the Barakar stage agree in having a peculiar laminated appearance, due to their being composed of alternating layers of bright, and dull, shaly coal. Some of the seams exhibit a peculiar spheroidal structure, and round balls, up to more than a foot in diameter, break away from the mass when the coal is mined.

The Raniganj Stage.—The Raniganj stage attains a thickness of 3000 feet in the Raniganj coalfield. It is chiefly composed of sandstones with some shales, and coal-seams. The coal has the same peculiar laminated appearance as that from the Barakars.

Character of the Damuda Coal.—In general the coal of peninsular India may be described as a laminated bituminous coal, in which dull and bright layers alternate. Much of it does not cake freely, while a not inconsiderable portion will not do so at all. However, from the coal of particular seams in the Raniganj, Karharbari, and Jharia fields, fairly good qualities of coke can be made. The percentage of ash in Bengal coal which is brought to market averages from 10 to 15 per cent., that is to say, that coal with less than 10 per cent. does not, as a rule, find a ready sale. In the producing fields of Hyderabad, the Central Provinces, and Central India the ash content is much higher, particularly in the latter provinces, where the percentage varies from 15 to 25 per cent.

The proportion of fixed carbon averages under 55 per cent. in the Raniganj field, while in the Karharbari and Jharia fields it is probably about 10 per cent. higher. There is no true anthracite; but the crushed and powdered coal at the foot of the Darjiling Himalayas approximates to anthracite.

Kutch.—Coal of Upper Jurassic age occurs in Kutch. The workings of Trombow were apparently the largest, and here a seam, measuring 16 inches, contained only 8 inches of good coal, the remainder being shale.

Trans-Indus Range.—The occurrence of lignite in the Lower Jurassic rocks of the Trans-Indus salt range has frequently excited comment. The deposits are found amongst variegated sandstones and shales, and but small workable areas occur near Kalabagh. Coal of the same age is said to occur in the Kohat district of the North-West Frontier Province, and in the Doab valley, Afghanistan.

Khasia and Garo Hills.—Coalfields of Cretaceous age are found in the Khasia and Garo hills of Assam as small basins of original deposition.

Tertiary Coal.—Coal of Tertiary age is found in the foothills throughout almost the whole of extra-peninsular India, from Baluchistan on the north-west to Assam on the north-east. It also occurs in Sind, Rajputana, Burma, and in the Andamans and Nicobars. The majority of the seams are of lignite. They occur in Eocene rocks, and are almost invariably associated with characteristic beds of nummulitic limestone. In Upper Assam, however, important

deposits of true coal are found, which are considered to be of Middle Tertiary, probably Miocene age.

Generally speaking, the Tertiary coals are bright, jetty, and non-laminated, and they contain a larger proportion of volatile matter than the coal of the peninsular fields; many of them are extremely friable and susceptible to disintegration under exposure; they do not cake as a rule, and the proportion of ash is usually small.

REVIEWS.

ASIA.

Danish Expedition to Arabia.

'Barclay Raunkiær. Gennem Wahhabiternes Land paa Kamelryg, 1912.' København: Gyldendalske Boghandel, 1913. Pp. 304. *Map and Illustrations.*

The route and chief incidents of the author's journey, which was made under the auspices of the Danish Geographical Society, have been already sufficiently described in the *Journal* (vol. **40**, p. 331). Though much hampered by the fanaticism of the Arabs, and not allowed to enter several of their towns, he could at least see the country, and he has been able from his observations, with some assistance from the narratives of Palgrave and Pelly, to compile a sketch of the geography of the country between Kuweit, Bereidah, Riadh and Ajer. The coastal zone from Kuweit to Katif is a sandy-clayey slightly undulating steppe, probably a continuation of the Syrian desert, and has a breadth of 100 miles at Kuweit and about 40 at Katif. In Hasa it passes into a desert of blown sand which skirts the coast southwards with a breadth of 25 to 30 miles. Westwards this steppe, the Debedebeh, borders on the somewhat higher sandstone plateau, Sumân, 90 miles across between Kuweit and Silfi, but only 55 on Pelly's route further south, beyond which it expands to 85 miles between Riadh and Hofuf. Next comes the sandy desert known as the D'hana, consisting of belts of dunes running north-west to south-east, and formed apparently by south-west winds. They are composed of reddish-yellow laterite sand and rise to considerable heights. Except the highest, they are clothed with scattered bushes and feathergrass. On the Silfi route the D'hana is 20 miles broad, on Pelly's route 60, and 35 between Riadh and Hofuf. It is said to run northwards into the northern Nefud. Westwards it is succeeded by a higher plateau country which may be called the Tuweik region after the rocky district which forms the backbone of Nejd. Jebel Tuweik itself consists of a series of plateaux more or less clearly separated, which slope gently towards the east and drop sharply to the plains on their western side, where small belts of blown sand, running generally north and south, skirt their margin. The rock of Jebel Tuweik is sandstone with limestone on the higher parts. The height may be estimated at about 2600 feet above sea-level, and 700 to 1000 above the plains.

The Wadi Rummah drains the northern part of this region and enters the Euphrates valley west of Zobeir. East of the Mishkar valley and south of Mejmaa a number of wadis carry water eastwards after rain and are lost in the desert. South of Thahaj begins the basin of Wadi Hanifa which, Captain Leachman states, undoubtedly reaches the sea south of Qatar (vol. **41**, p. 147).

Some particulars are also given of the Arab tribes, their migrations, dwellings, etc.

survey was joined with the recent explorations of Captains Bailey and Morshead. With the completion of this work, the surveys of the last three years, which commenced shortly after the murder of Mr. Noel Williamson in 1911 in the Abor country, now cover practically the whole of these hitherto little-known regions—a total area extending over some 30,000 square miles along the entire Indo-Tibetan frontier from Bhutan to Burma. This constitutes a very considerable addition to our knowledge of the jungle tribes of the north-east frontier of India.

Himalayan Glaciers: A Correction. — Dr. Hunter Workman writes: "Having recently had occasion to consult the table published on p. 289 of the March, 1914, *Geographical Journal* with my paper on the 'Physical Characteristics of the Siachen Basin and Glacier System,' I noticed for the first time several inaccuracies, which crept in during its transition from the manuscript to the printed form, and were overlooked in the revision of the paper. The table should read as follows:—

	Length.		Head.		Tongue.		Total fall.		Average fall.
	kil.	miles.	metres.	feet.	metres.	feet.	metres.	feet.	
Siachen ...	72	45	6400	20,992	3704	12,150	2696	8842	1 to 26
Chogo Lungma	48	30	5854	19,200	2926	9,600	2928	9600	1 to 16
Biafo	59	37	5335	17,500	3201	10,500	2134	7000	1 to 27
Hispar ...	58·5	36·6	5335	17,500	3353	11,000	1982	6500	1 to 29
Baltoro ...	57·6	36	5072	16,637	3353	11,000	1719	5636	1 to 33

The coefficient used in the reduction of metres to feet and *vice versâ* is 3·28 +, omitting the remainder of the decimal, which gives results sufficiently accurate for the purpose of the table, since from the nature of the case the altitude can only be considered as approximate."

The Relations of Tibet to the Chinese Empire.—It has lately been announced that negotiations which had been on foot for some time between China, Tibet, and this country for the precise definition of the future relations of Tibet to the Chinese Empire have been rendered abortive by the failure to agree in the matter of boundaries. As a result of a conference between representatives of the three parties, which met at Simla last autumn, it was practically agreed that Tibet in its widest sense should in future be divided into two portions—Inner Tibet (so designated from the *Chinese* point of view—the part nearest to China), which should remain more or less under Chinese control; and Outer Tibet, which should be practically autonomous, China undertaking not to interfere in any way in its internal affairs, though retaining the right to maintain a Resident at Lhasa. It appears that Tibet claimed the inclusion in Outer Tibet of the whole of the Koko-Nor province, including the border zone stretching southwards, east of the Salwin, past Chiamdo. China, on the other hand, was ready to agree to the inclusion, in Autonomous Tibet, only of the northern portion of the disputed territory, and as far east as the Salwin, while demanding that the whole zone east of that river and bordering on Sechuan, of which she has of late been in armed occupation, should be included in Inner Tibet. All attempt to reach an agreement seems to have been definitely abandoned, for the time at least.

AFRICA.

Ancient Egyptian Mine Plan.—This plan, contained in an ancient Egyptian papyrus of about 1300 B.C. preserved at Turin, has attracted some attention as the oldest known map in existence, though trustworthy data have hitherto been lacking for the identification of the site represented. The question

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EXPLORATION ON THE TSANGPO OR UPPER BRAHMAPUTRA.*

By Captain F. M. BAILEY.

During the winter 1912–13 an expedition was despatched by the Government of India to survey the basin of the Dibang river, in one of the upper valleys of which was found the small village of Mipi, inhabited by Tibetans who had settled there a few years previously, after driving out the Mishmis who were the former owners of the land. The expedition made this village the base for their operations in one branch of the river, while the survey was carried up to the watershed. These Tibetans had come from Po-me, and from them we obtained information about that country and the routes leading to it. During a stay of over a month in the neighbourhood the Tibetans were persuaded to conduct a small party over the passes into Po-me as soon as the road, which is closed in winter by snow, should be passable. This arrangement was not concluded without reference to the lamas and astrologers, who reported favourably on the project.

We considered ourselves extremely fortunate in getting this opportunity of entering a country which had for many years caused much speculation among geographers. Although, as a result of A.K.'s journeys in 1882, it was assumed that the Tsangpo reached India as the Dihang, and so developed into the Brahmaputra, yet this had not been proved by actual observation. Moreover, the difference between the levels of the river in Tibet and in the plains of India was so great as to lead many people to believe in the existence of large falls. Several previous attempts had been made to decide this question. In 1878 a native explorer, G.M.N.,

* Royal Geographical Society, June 22, 1914. Map, p. 428.

was sent from India, who followed the Tsangpo down as far as Gyala, but for various reasons his reports were unreliable. Again, in 1884, a better-known explorer, Kinthup, was sent, who succeeded in following the river down to Pemaköchung, and who then made a *détour*, and, striking the river again below the impassable gorge, followed it down into the Abor country, but, owing to the hostility of the people, he was not able to reach India by that route. He reported that there was a fall in the river 150 feet in height at Pemaköchung. Quite recently I questioned Kinthup on his recollection of these falls, which he then said were only 50 feet in height; from this and from statements in his report, which was published in 1887, it is clear that either he or the interpreter had confused this fall with one on a small stream which joins the Tsangpo at Gyala. Great credit is due to Kinthup, who showed extraordinary pluck and perseverance in his explorations, but, as he was quite illiterate, and the account of his travels was given from memory after his return, it is not surprising that several mistakes and omissions occurred in describing the routes he followed. The proposed attempt to trace the river down to the plains on the departure of the mission from Lhasa in 1904 was vetoed by the Government, while more recently the difficulty of moving and feeding troops prevented the exploration parties sent out by the Abor Expedition from going beyond the northern Abor frontier. At the time that our journey commenced, a party under Mr. Dundas was surveying the Dihang valley, having marched up through the Abor country, and two officers of the Royal Engineers, Captains Trenchard and Pemberton, succeeded in reaching the village of Pe, above the gorge, shortly before our arrival there.

Our object was to cross from the Dibang valley in which we had been working all the winter, into that of the Dihang, and to follow the river upstream as far as possible in order to map its course and to ascertain how it descended from the Tibetan plateau, through the Himalayas, to the lower levels at which the Abor expedition had seen it.

On the return of the expedition to India, Captain Morshead, R.E., of the Survey of India, and I collected what stores we could and started off on our six months' journey. Our party was imperfectly equipped and organized, but this was unavoidable, as we started on the spur of the moment from the most advanced post which had been laid out in the Dibang valley and had no time to obtain many necessaries from India. We finally left Mipi on May 16, 1913, accompanied by ten coolies and some local guides. Our road led up the Yongyap Chu, and was very rough and little used; this spring we were the first to use it. We travelled very slowly, moving our rations to the Latsa or camp at the foot of the pass. During the whole of this time we had incessant rain, which the guides whom we had brought from Mipi told us would mean much fresh snow on the passes. On this part of our road we supplemented our rations of flour and rice by pheasants, of which there were great numbers, and of which we killed three varieties. The Tibetans had calculated on what day we should

reach the pass, and had arranged for the monks at Mipi to hold a special service that day in order that we should have fine weather. We did not reach the pass by the expected day, but noticed that on it more rain than usual fell. We had intended remaining in our camp, which was in 2 feet of snow, at the foot of the pass, until a fine day should enable us to cross over, but, owing to an unexpected and unaccountable shortage in our rations, we were only able to wait one day, on which it rained incessantly, and on the next day we were obliged to start, though the weather showed no signs of improving. Our road lay over snow at first hard and fairly level, but later very steep and soft, and over this soft snow, in which we sank up to our waists, we were obliged to climb 1200 feet in pouring rain and thick clouds. When nearing the summit our guides confessed that they were lost, and we were obliged to wait while men went forward to find the summit of the pass in the dense clouds. This pass, the Yongyap La, proved to be 13,020 feet above sea-level; here we crossed from the basin of the Dibang into that of the Dihang or Tsangpo, in which we remained until we entered that of the Subansiri on September 4. From the pass we had a very steep descent over snow which was continually coming down the hills in small avalanches, and finally came to hard snow, over which we travelled until we reached a camping ground below the snow-line. The next morning we woke to find five of our party helplessly snowblind, and were obliged to wait a day, during which we could only afford to issue half the ordinary ration. The valley in which we now found ourselves joins the Tsangpo between Bungmo and Meto villages, where it is called the Shümo Chu, and where we subsequently crossed it by a cane suspension bridge. There is, however, no track down the valley to the Tsangpo, consequently, we were now cut off from all supplies by two snow-covered passes, one before and one behind us. The next morning the sick were well enough to travel, and we marched one day downstream, after which we turned up a tributary, and, passing the Rirung Tso, a narrow lake a mile and a half in length, ascended a tributary for two days, where we reached a camp in snow at the foot of the Pungpung La. We were now on a pilgrim road which leads from Chimdro to a holy mountain called Kondü Putrang; the track was consequently slightly better. The explorer Kinthup had visited this mountain from Rinchenpung in 1882.

The Pungpung La was crossed at an altitude of 14,300 feet, during a very hard day's march of twelve hours in pouring rain through soft snow thigh-deep; after crossing the pass we found a small lake at about 13,000 feet altitude, and, passing down a gloomy gorge in which avalanches made a continuous roaring, we eventually camped under an overhanging rock just below the snow-line, some 3000 feet below the summit of the pass.

The whole of our road from one march above Mipi to this point had been through fir forest, in which at certain times of the year takin are

plentiful. We saw numbers of pheasants, monal, tragopan, and blood pheasants, which we killed for food. The latter were very numerous and confiding. The next day we descended the valley to Chimdro, a collection of villages at an altitude about 6400 feet, in one of which we stopped. This place was ruled by a Dzongpön, who was appointed by the Poba chief. He was somewhat perturbed at our unexpected arrival, but offered to supply us with food and with transport coolies. This was a rather critical point in our journey, as had this, the first Tibetan official we came across, refused to recognize our right to be supplied with food and means of transport, we should have been unable to obtain it anywhere; as it was, on arriving at a village the people seeing that we brought in local transport coolies would replace them and never question our right to this concession. The valley at Chimdro is well cultivated with crops of barley and maize; above the cultivation is thick forest.

While here news was received that the Abor survey party were on the Abor-Tibet frontier. After halting two days we left Chimdro on June 3 and descended the valley, reaching the junction of the Chimdro river with the Tsangpo at Kapu in three days, the road being through thick forest and climbing over ladders in many places. At Kapu we got our first sight of the Tsangpo valley. The hills were steep and clothed with thick forest; about 1000 feet above the river there was a belt of more open hillside with cultivation and an occasional village. The river itself was flowing very fast, breaking into rapids in places. At Chimdro the people were Pobas and Khambas, and their houses substantially made of stone and wood with wooden roofs. At Kapu the people were Mönbas, whose ancestors had immigrated from eastern Bhutan and the neighbourhood of Tawang about one hundred years ago. They had driven out the Abors, who were then in occupation of the land, though some of the Abors had remained and are known to the Tibetans as "Lopas," a name given to all the savage tribes from the Mishmis on the east to the Akas on the west. Several of the villages in this part of the Tsangpo valley are inhabited by these Lopas who, by contact with the Mönbas, have become very like them and wear Tibetan dress, and many of whom have adopted the Buddhist religion. The houses of the Mönbas and Lopas in this part of the valley are built of wood or bamboo, usually on piles and with thatched roofs, and are not nearly so well built as those of the Pobas at Chimdro or in Po-me. The people grow crops of maize, marwa, rice, and other sub-Himalayan crops. From Kapu we sent letters to the Abor survey party, and while waiting for an answer moved leisurely down the valley four days to Rinchenpung (6700 feet), a lamasery prettily situated in a grassy hollow in the forest over 4000 feet above the river. We remained here three days, after which we descended into the hot valley of the Tsangpo and retraced our steps to Kapu, hoping every day that the expected answer from the Abor survey party would overtake us. Before

reaching Kapu we took a hypsometrical observation for altitude in the river-bed at a point about half a mile below the confluence of the Chimdro Chu with the Tsangpo and on a level with the actual confluence of the waters. The height above sea-level proved to be 2610 feet. This was an important point, as we were not able to take another observation at the water-level while in the valley below the impassable gorge. We travelled up the left bank of the Tsangpo valley above Kapu, the road being very bad and hilly, and we had frequent ascents and descents of from 1000 to 3000 feet. The hills as we ascended the valley became steeper and the country drier, and the thick tropical forests gave way to pines. Round the villages were peach and plantain trees, and in place of rice we found a little barley growing and small quantities of indigo. We estimated that in places the hills sloped up from the river for a height of 5000 feet at an angle of 45°. These hillsides were covered in forest where the precipices did not prevent it. At the village of Pango we found a quarry of soapstone out of which the people make bowls and cooking utensils, which are extensively used in Po-me, and which we occasionally found in Kongbo and even further afield. At the miserable village of Tsangrang we found the Lopa inhabitants pounding the wood of a tree in artificial cup-shaped hollows on a rock. After pounding the fibres are removed, and the residue, resembling sawdust, is cooked and eaten.

On June 19 we reached the village of Lagung, where we found a Poba official, named Nyerpa Namgye, with whom we afterwards made great friends. It would have been possible for us to have continued some 30 miles up the bank of the Tsangpo, and to have reached the junction of the Po Tsangpo at Gompo Ne, but our Poba friend pressed us to go with him direct into Po-me, and, having regard to the general circumstances of the case, we thought it better to take this opportunity of entering an absolutely unknown country at the invitation of one of the local officials than to risk a misunderstanding with the Poba officials by insisting on disregarding his offer. Another fact which induced us to leave this section of the river was that we believed that we should be able to descend the Po Tsangpo to its junction with the Tsangpo, and then follow the latter river down to Lagung. This eventually proved impossible owing to broken bridges.

We left Lagung in company with the Poba official on June 21, and on the third day crossed the Sü La, a pass which brought us into the valley of the Po Tsangpo, the local name for the lower valley of the Nagong Chu. The pass was 13,445 feet in height, and Captain Morshead was fortunate in being able accurately to fix his position and altitude here by triangulation from the peaks of Namcha Barwa. We ascended over nearly 3000 feet of hard snow, on which the men in places cut steps with their swords, and descended to a camp just below the snow-line. From a point about 1000 feet above the pass we had a good view of a snowy range on the north bank of the Po Tsangpo. On the pass were monal pheasants and

another strange game bird; the only specimen which we shot fell 500 feet down the steep snow-slope, and was lost under a snow-drift.

The day after crossing the pass we made a short march while Nyerpa Namgye went on to Showa, the capital of Po-me, to warn the people of our arrival. He told us that we should probably be kept in Showa as prisoners until a letter had been written to the Abor survey party to ask them if they knew anything about us. Many of the people still suspected that we were Chinese, of whom they were in great fear. The track lead down a valley through fir trees, with open marshy clearings, on which were luxuriant grasses and alpine flowers. On reaching the bank of the Po Tsangpo, we were struck by the enormous size and rapidity of the river. We estimated the width at 80 yards, and the water dashed by in a mass of foam. We travelled down this valley to Showa (8520 feet), the capital of Po-me, which we reached on June 25. The place had been destroyed by the Chinese in 1911. It consists of about forty farmhouses on both sides of the river, which is crossed by a magnificent cantilever bridge of 150 feet span. The fields are divided by thorn hedges, or by rows of peach and other trees; good crops of peas and barley were growing, among which small boys were continually shouting to scare the birds—doves, ravens, choughs, and parrots. Higher up the hills were covered in forest. Po-me is to a great extent independent of Lhasa, and was ruled by a chief. This chief was killed by order of the Chinese, and his two wives were taken to Lhasa. They had recently returned, and we wished to visit them, but excuses were made to prevent us. One of them was performing a religious meditation, and could not be disturbed, while the other had a toothache. We were visited by the Council, a dirty and unimpressive lot, who had recently been appointed to replace the former members who had been decapitated by the Chinese. They were very suspicious of us, and thought that we had something to do with the Chinese. This suspicion was confirmed in their minds by the Chinese writing on a tablet of Indian ink, which it took us some time to explain. After three days spent in explanations, we satisfied the Council of our harmlessness, and were told that we might go into Kongbo, but were prevented from journeying up the valley, which we were most desirous of doing. While at Showa, the long-expected answer from the Abor survey party arrived, which at any rate convinced them that we were "under the same King" as the Abor party.

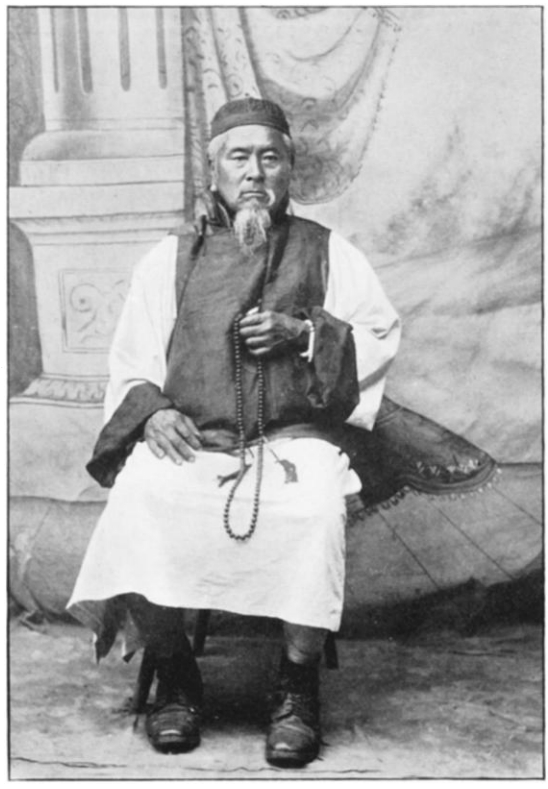
On June 28 we left Showa, after the officials had shown us round the ruins of the palace and lamasery which the Chinese had burnt. We descended the valley for three days, when we reached the bank of the Yigrong Tsangpo, a large tributary which joins the right bank of the river. The bridge was broken, and we were obliged to march two days up the Yigrong until we reached a point where some years previously a tributary, the Tralung, had dammed the river and formed a lake (7300 feet in altitude). The breaking of this dam caused the disastrous floods, of which traces were seen in Assam, and which Mr. Bentinck mentioned in

his lecture on the "Geographical Results of the Abor Expedition" (*Geographical Journal*, February, 1913, p. 107). We were obliged to ford the Tralung which, though more than knee-deep with a very swift current, is not bridged, as the people say that evil spirits send floods down to take away any bridges that they build. The Tralung had cut about 50 feet, and the Yigrong about 350 feet, through the *débris* which had been the cause of the lake. We were ferried across the lake, in a boat made of two dug-outs tied abreast, to Dre, a village at which we halted for a day. We noticed cormorants fishing in the waters of the lake, and were told that numbers of geese visited it in winter. Iron is mined here, and the people are famous for the swords which they make. From Dre we descended the right bank of the Yigrong to its junction with the Po Tsangpo. Captain Morshead found the width of the water of the combined rivers below the junction, where it was flowing gently, to be 280 yards. We descended the Po Tsangpo one day to Trulung, a village in which Kinthup stopped when escaping from slavery at Tongkyuk. The village had been destroyed by the Chinese. We had hoped to be able to continue down the river from here to its junction with the Tsangpo, but were prevented by broken bridges, which are carried away every summer. The altitude of the river-bed was here 6420 feet by hypsometer. We were told that from a spur above Trulung we should see the hills above the junction of the river with the Tsangpo at Gompo Ne, but though we waited several hours, the clouds refused to lift. Just beyond Trulung we left the Po Tsangpo, and ascended the valley of the Rong Chu, up which we marched three days to Lunang, the first village which we reached in the province of Kongbo. The road was through pretty scenery, with clearings in the forest covered in flowers, among which we noticed blue poppies, purple iris, many varieties of primula, and the poisonous aconite, while we were able to eat rather tasteless raspberries all along the road. We now left the Pobas behind, and were among a more civilized type of Tibetan. The Pobas usually wear their hair loose, uncut, and untied. The women do their hair in a peculiar peak over the forehead, which is formed by dressing it over a piece of bamboo, which is concealed by the fringe. The dress is the same as that of other Tibetans, but they are fond of wearing a skin coat with the fur outside on the top of their woollen clothes; the skins used are bear, serow, or gooral. Their language is a dialect of Tibetan, resembling that of the Khambas. The trees were mostly pines, except at the lower elevations in the bottom of the valleys. There were also some fine cypress trees, one of which we measured and found to be 180 feet in height. The people keep bees in most villages in hives made of hollowed-out logs. In the Yigrong valley we obtained a new species of gooral, which Mr. Pocock has named *Nemorhœdus baileyi*. Takin and musk deer are found, and bharal are on the higher hills, while Tibetan muntjac (*M. lacrymans*) frequent the lower forests. There are several varieties of pheasants, though we did not obtain any

specimens; from their descriptions and from feathers which we picked up, these are probably *Crossoptilon harmani*, *Lophophorus sclateri*, and *L. refulgens*—the common and Sclater's monal. I also shot a specimen of the common hill partridge (*Aboricola torqueola*). At Lunang, the people in their language and style of dress are more Tibetan than the Pobas. They wear peculiar hats, like those of clergymen, made of yaks' hair felt. Their hair is done in two queues, which are crossed behind and fastened together on the top of the head—a great contrast to the loose, shaggy hair of the Pobas.

From Lunang we marched two days to Timpa, on the bank of the Tsangpo, crossing the Nyima La, 15,240 feet, the pass dividing the Rong Chu from the Tsangpo itself. At the pass the vegetation and character of the country changes with great suddenness, the country in the valley of the Tsangpo being much drier. On the road we were met by some small officials whom the Dzongpön of Tsela, the official in charge of this district, had sent to greet us. The next day, July 13, we crossed the river by a ferry. The river was broad, with a slow current, and just below the ferry it opened out to a width of about 600 yards. The altitude was 9680 feet. The problem before us now was to follow the river down to the point at which we had left it, and to see how it made the enormous descent to the Chimdro confluence, where we had found the altitude to be 2610 feet. The valley is very dry, and here for the first time we found irrigated cultivation, among which were partridges. The crops were the usual Tibetan ones of barley, wheat, buckwheat, and mustard, the country being too dry and elevated for the maize and millet which is grown in Po-me. On the opposite bank we were met by the Dzongpön, who had come down to meet the members of the Abor survey party, who had left eight days before our arrival. The Dzongpön's son is one of the four Tibetan boys at present at Rugby, and is a promising cricketer.

After halting a day we went down the valley 22 miles to Gyala. On the road I saw a flock of monkeys, and at Gyala I succeeded in shooting some specimens of the rare Harmans pheasant (*Crossoptilon harmani*). Here we collected supplies for our attempt to follow down the river. We were not, however, very hopeful of being able to descend the valley very far, as at this time of year the track, which is in places in the river-bed, is closed by the water. Four days' march below Gyala we reached Pemaköchung, a small lamasery where Kinthup and the Chinese lama who had been sent to survey had remained three days in fruitless search of a road. The valley became much more wooded below Gyala, and the country is evidently subject to a heavier rainfall. About 2 miles below Pe the river breaks into rapids, and, with the exception of a still stretch near Gyala, these continue down as far as we were able to follow it. About 1 mile before reaching the lamasery of Pemaköchung a road goes down to the bank of the river at the point where the falls which Kinthup



KINTHUP.

MÖNBAS IN PEMAKÖ.

POBA AT SHOWA.

LOOKING DOWN TSANGPO FROM FERRY AT PE.

described as being 150 feet in height are situated. The river here rushes through a gorge about 50 yards in width, and at one point dashes down more steeply some 30 feet. This fall was not vertical, partly on account of the rapidity of the current. The people perform a pilgrimage to this place, the pilgrims climbing through a natural tunnel in the cliff. I was able to go part of the way, but the mouth of the tunnel is under water in summer. Just below Pemaköchung a spur called Gyama Taki runs down to the river, and appears to cut off all possibility of farther progress down the valley.

Fortunately a spell of fine weather enabled Captain Morshead to take some observations to the fixed peaks of the Namcha Barwa range, while I occupied my time in investigating the possibility of going further downstream. One and a half miles below the lamasery, after crossing a stream which came from one of the glaciers of the mountain, I reached another named Sanglung. The stream was too large and swift to ford, and too wide to bridge easily, so I moved up stream until I reached the point where it emerged from the ice-cave of the glacier and was able to cross over the moraine which covered the ice. The snout of the glacier was 9030 feet above sea-level in about 29° 45′ N. lat. Having found a way to the foot of the spur I returned, and the next day we marched out and camped at a clearing I had found in the forest. Another day was spent in cutting a road 2400 feet up the spur, near the top of which we found a track which had been cut some years previously but about which our guide, a cattle herdsman of Pemaköchung, knew nothing.

Having cut the road we returned to camp, and the next day crossed the ridge and descended to a stream on the other side, where we camped. From here there was no road or track of any kind, and we spent a day in cutting our way through the jungle, and had some difficulty in finding water, but eventually bivouacked near a small trickle, where we were obliged to build platforms on the steep hillside on which to sleep. The next day we continued cutting through rhododendron forest, and eventually found ourselves on a steep cliff which dropped into a stream called the Churung, which also emerged from a glacier. From this point we could see some distance down the valley, and as we had only two days' food in hand, and as it would have taken us more than that time to reach the next spur and see more of the river, we decided to return. From this point we saw some snow peaks which must have been near the Sü La, and could trace the general direction of the valley of the Tsangpo after it had bent to the south.

On reaching our camp on the east side of the Gyama Taki spur, we were met by one of our coolies who had been sent to Pemaköchung to try and get some more food, and who reported that a party of Mönbas from Pemakö had just come up the bed of the Tsangpo from Payü village, the first time, as we were afterwards told, that such a thing had been done for twenty years. We were now very short of food, and it was impossible for us all to go down the valley, so after rationing Captain Morshead

and the coolies to enable them to return to Gyala, where fresh supplies could be obtained, I, with one coolie and the remainder of the food (15 lbs. of flour), went down the bed of the Tsangpo on the tracks of the Mönbas who had returned. I had no difficulty in following them, and soon came on them collecting honey. They offered to help me to go to their village and to send men back with me to Pemaköchung. On their advice I went on a few miles and camped in the bed of the Churung Chu, expecting that the Mönbas would join me in the evening after collecting their honey. However, they did not arrive, and so at daybreak I started, and endeavoured to follow their tracks down stream, but could find no trace of their road. While looking for it in the dense forest I had the misfortune to lose my camera, and spent half the day in searching for it without success. In the evening I again camped in the bed of the Churung, and the Mönbas joined me at dusk.

The next morning we started together. The track which we followed was, I was told, made by takin in their annual migrations, and the Mönbas had in places improved it by cutting the jungle or building bridges. At one point some of the people left us and took a short cut to the village of Luku, which is below Payü on the Tsangpo. At length we left the river and climbed about a thousand feet; the Mönbas then told me that they could not take me to their village, and advised me to return, saying that there was a difficult cliff ahead on which ropes would be required, and that I would not be able to pass it if I wore boots. I insisted on going with them, but as we went they gradually drew ahead, and, on rounding a bend of the hillside, I found they had thrown down some of my things which they were carrying and had hurried on. I followed as quickly as I could, and saw that the last of them had passed the difficult cliff, and the whole party were hurrying away as quickly as the steep hillside would allow, and refused even to look round when I called. When my solitary coolie arrived we tried to cross the cliff, but found it impossible as we only had one short piece of rope which was used for carrying the load. After some trouble I let him down with the aid of this, and told him to try and bring the Mönbas back to help us and our load over. He found them cooking a meal a short distance on, but they refused to return, partly I think because, having only one man with me and carrying a good deal myself, they thought I was a person of no importance and not worth taking any trouble about.

Before they left me I had luckily been talking to them about the course of the river here and got what information they had to give. At the place where they deserted me their road left the Tsangpo and crossed a spur round which the river flows. From this point I returned and attempted to pick up the tracks of the people who had left us for Luku village earlier in the day, but could not find any, and think they must have gone up the stony bed of a stream, probably through the water in places. I then returned as quickly as possible for Pemaköchung following

the Mönbas' road the whole way, which went at the foot of the Gyama Taki spur and avoided the stiff climb over it which we had taken. At Pemaköchung I nearly came to blows with the people before I got enough food to take me to Gyala. At Gyala I found Captain Morshead busy passing the coolies across a rope bridge.

On this part of the river we took frequent boiling-point observations for altitude. These were checked by a trigonometrical altitude on the Sü La, and another at Pemaköchung. The river at Pe is 9680 feet in altitude, and flows quite smoothly, but about two miles lower it breaks into rapids, which continue, in places being extraordinarily steep, for about 16 miles to the neighbourhood of Gyala, where the river is again quite smooth. Opposite Gyala a small stream flows through cliffs and drops into this smooth part of the river. This is what Kinthup described as a lake, and it is in this waterfall that the god Shingche Chögye is carved or painted on the rock behind the waterfall. We did not see him, as he is only visible in winter when there is little water in the fall. This still stretch of the river lasts for about 8 miles, after which rapids again commence and continue as far as we were able to follow the river with the exception of a short, smooth stretch below Gyama Taki, which is followed by a fiercer rapid.

At Nyuksang, a camping ground 34 miles below Pe, we found the river-level to be 8730 feet, giving a drop of 28 feet a mile. The next point at which we took an observation was at the falls at Pemaköchung, where the altitude was 8380, the distance being $14\frac{1}{2}$ miles and the drop 24 feet a mile. Again, at the confluence of the Sanglung stream, 3 miles further, we found an altitude of 8090 giving a drop of about 97 feet a mile, which includes the 30-foot drop at Kinthup's falls, $1\frac{1}{2}$ mile further another observation gave an altitude of 8010 feet giving a drop of 53 feet a mile, 11 miles further at the furthest point I reached in the river bed, and about two miles below the Churung river, the altitude was 7480, giving a drop of 48 feet a mile. From here we did not see the river until Lagung, the point at which we left it to cross the Sü La. Unfortunately here we were not able to take an observation in the river-bed, but about 45 miles down stream we obtained an altitude of 2610 feet at the confluence of the Chimdro river.

In discussing the question of falls on the river, the above is the data on which we have to form an opinion. Somewhere in this unknown portion of the river the Po Tsangpo joins the Tsangpo. From information received regarding the marches on this river, we have placed the junction approximately on the map, and, by measuring the actual drop of the Po Tsangpo from Showa to Trulung, the point at which we left it, and by supposing that it maintains a similar steepness to its junction with the Tsangpo, we can estimate the height there at about 5700 feet. The Sü La is closed by snow in winter, and the only road from Po-me into the lower Tsangpo valley is that leading down the Po Tsangpo to

near its junction with the Tsangpo; the road then goes down the latter river to Lagung, the place at which we left it. We consequently met many people who knew this road intimately, and were able to get a fair idea of the distance from Lagung to the junction, which we put at 30 miles. On this portion of the river the people we asked agreed in saying that there were no falls, though there is apparently an extraordinary turmoil of waters where the two rivers join at Gompo Ne. If we accept the estimated height of 5700 feet at Gompo Ne and the estimated distance of 30 miles from that place to Lagung, we find a drop of 3090 feet in 75 miles between Gompo Ne and the Chimdro river confluence, the next point down stream at which we took an observation. This gives a fall in the river of 41 feet a mile. It must be remembered that we followed the greater part of this 75 miles, and saw that there were no falls on it. There now remains a gap between the lowest point I was able to reach below Pemaköchung (7480 feet) and Gompo Ne (5700 feet). There is no track of any kind on this stretch of the river, and it was difficult to obtain any information, but, from what I was able to find out from the Mönbas, who deserted me at the cliff, as recounted above, the distance must be about 20 miles, and the drop 1780 feet, giving a fall of 89 feet a mile. These Mönbas used to hunt takin on the right bank of the river in the neighbourhood of the unknown stretch, and told me that they had occasionally seen portions of the river which descended in rapids; they knew of no great fall, and it is unlikely that they would be ignorant of any enormous waterfall in this neighbourhood.

The distances on the river are estimated by the time we took on the road which follows the river bank. This, of course, only gives an approximate estimate, but it was impossible to measure small distances off the map at the scale at which it was made, and any error in distance should be proportionate over the whole.

The valley below Gyala is thickly wooded and almost tropical in appearance, while higher up the hillsides we cut through forests of rhododendron and firs. The larger animals here are takin, serow, gooral, musk deer, and bears, while of pheasants we saw tragopans and blood pheasants.

The high snow peak called Gyala Peri (23,460 feet), which Captain Morshead and I had seen from the Mishmi hills some months previously, was an interesting discovery as well as the glaciers which flow from it and also from Namcha Barwa (25,445 feet). The distance between these two mountains is about 14 miles, and through this gap the Tsangpo breaks at an altitude of about 9000 feet. This is another instance of the fact noticed by Colonel Sir Sidney Burrard, that the rivers which break through the Himalayan range, choose the highest part of the range through which to cut.

At Gyala we crossed the river by a rope bridge, and after inspecting the fall in which Shingche Chögye is tied we proceeded up the valley.

Above Gyala the country changes with great rapidity, and we were soon in the typical dry Tibetan climate with irrigated crops, though we could see forest up on the hillsides. We travelled up the north bank of the river, and after visiting the important lamasery of Temo, reached the point at which a large tributary, the Gyamda Chu, joins the Tsangpo. We crossed the former in skin coracles and spent a day at Tsela as the guests of the official who had met us at Pe; from Tsela we had an uneventful journey up the valley, being well received everywhere, and passing out of Kongbo province through Takpo to Ü, the large province in which Lhasa stands. We crossed the river several times to take advantage of the best road.

In the valley we visited the large and important lamaseries of Trashi Rapden, Ganden Rapden, and Takpo Tratsang; the latter contained an image of Buddha so large that the lower part of the body was in the lower storey while the upper part appeared in the temple on the storey above. We also passed Trung Kang, the birthplace of the present Dalai Lama; here on the site of the cottage in which he was born a temple had been built, into which no one was allowed to enter, but we persuaded them to make an exception in our case. Another place of importance was Lhagyari, the seat of an important semi-independent family, now represented by a boy of thirteen.

In the lower part of the valley across the range to the south live various tribes called by the Tibetans Lopas (probably Abors), who cross the range at certain seasons to obtain salt. One valley south of the range, probably the upper part of the Siyom valley, but called Pachakshiri by the Tibetans, is inhabited by Mönbas, who immigrated about 100 years ago. In the lower part of the Tsangpo valley we noticed many ruins which we were told were the result of an invasion 200 years ago by people called Jungar, whom Colonel Waddell states were Elleuth Tartars. We were obliged to leave the river twice to avoid gorges; once for only one day's march and the second time for five days. The river drops steeply in the part which we did not see on this second occasion, and we estimated a drop of 800 or 900 feet in 40 miles. On both occasions we found that as we left the valley and climbed the hills to the south we came among much larger types of vegetation, larch, birch, and rhododendron, denoting a damper climate. Lower down in its course the river generally flowed in a broad open valley among sand spits and islands; higher up, the valley was narrower and the river more swift with small rapids in places. At most villages there were skin coracles in which the people cross; ponies are crossed in these boats by having their feet tied together and being thrown in on their backs as their feet would pierce the leather of the boats. The valley gradually got drier as we ascended, and the houses adopted the flat mud roof in place of the pent wooden roof of lower Kongbo. In the drier parts of the valley the only large trees were cypress, except round the villages, where poplars, peach,

apple, pear, and walnut trees are grown. The crops included peas, beans, and radishes, vegetables which were a very welcome addition to our fare. Of game we saw bharal, musk deer, and gazelle, the latter were at Lhagyari; we also saw tracks of bears, and were told that monkeys and serow were plentiful in the thicker forest which clothed the hills. There were also numbers of partridges, Harman's pheasants, and snowcock (*Tetraogallus tibetanus*). There was also another pheasant called "Kuling" by the natives, of which we never succeeded in obtaining a specimen. Parrots also were common up to a height of about 11,000 feet.

After ascending the valley some 320 miles from the lowest point which we had reached below Pemaköchung, we came to the large and important town of Tsetang, at an altitude of 11,850 feet. The town has a population estimated at about 3000, among whom are some Ladaki Mohammedans, who gave us a very garbled version of the later developments in the Balkan war, which interested us, as our last newspaper was more than four months old. Here we found the traders very anxious to exchange Tibetan money for our Indian money, and we obliged them to the extent of exchanging eight sovereigns, which traders who visit India understand. In the bazaar, which is similar to those at Lhasa and Gyantse, we saw many articles of European manufacture for sale. We made friends with the head Ladaki trader, who was of great service to us in giving us cash for a cheque when, later on, our money was stolen.

After halting one day we left Tsetang on August 31, and, following the footsteps of the explorer Nain Singh, ascended the fertile Yarlung valley, in which is the town of Netong, of about the same size as Tsetang. In Lharu, a smaller town, we were received by the official whom I had met several years previously, and were shown a devil dance which happened to be in progress. We also passed a fine temple, called Tramdru, with magnificently ornamented altars, and where we were shown a room with 100,000 clay images of Lopön Rimboche, or Padma Sambhava, an Indian saint. As we ascended the valley the cultivation became less, and at the Yar Tö Tra La, 16,700 feet, we left the valley and entered a large uncultivated plain, drained by a stream which joins the Tsangpo below Tsetang. We ascended this stream to its source at the Pu La, where we found people washing gold on its banks. At this pass we left the basin of the Tsangpo for the first time since entering it at the Yongyap La on May 26, and entered the drainage system of the Subansiri. We camped at the village of Kyekye, and the next morning woke to find that three of our ten coolies had stolen all our money and absconded during the night. Although we ourselves searched and sent word to the neighbouring Tibetan officials, we never heard any more of them. Unfortunately, our cartridges were packed with the money, and, except for a few we carried, they were all stolen.

The country in this neighbourhood is elevated, and the villages few and small. The usual Tibetan animals of the uplands were abundant, bharal gazelle and hares: *Ovis Ammon* were also said to be plentiful, but we saw none. From Kyekye we went down the Char river, a branch of the Subansiri, the valley becoming wooded as we descended; the trees were rhododendron, birch, willow, juniper, and a few firs. Among the smaller bushes were numbers of Harman's pheasants; round the villages walnut and peach trees were growing.

We left the valley of the Char, and, ascending a tributary, crossed into the basin of the Tsangpo by a little-used pass 17,000 feet in height. After travelling in valleys, the waters of which eventually flowed into the Tsangpo, we reached the Tsari Chu by the Kongmo La, 17,520 feet. This river is another branch of the Subansiri. The whole of this district of Tsari is considered sacred, and no crops may be grown and no animals killed. We saw a good deal of game, including wolves, musk deer, bharal, and stags (*Cervus affinis*). One of the latter I shot, and this sin was eventually made an excuse for my going round the pilgrimage. The climate of the Tsari valley is very wet, and the hills covered in thick fir forest. This is peculiar, as the valley of the Tsangpo to the north and the valleys to the south are very dry, and require irrigation for the crops.

We stopped a day in Chikchar, where we saw some holy temples, in one of which the Dalai Lama lived when he performed the pilgrimage in 1900. The idols were beautifully ornamented, and the butter-lamps of solid gold. We descended the Tsari Chu to the last Tibetan village called Migyitün, and then retraced our steps to Chikchar, from which place I separated from Captain Morshead and took the pilgrim road, which was difficult, and crossed several high passes, on one of which was a half-dead glacier. The road leads round a holy mountain called Takpashiri, but atrocious weather prevented us from ever seeing the peak. On the road there were thousands of small white maggots which eventually become so numerous that the road has to be closed, as to kill one would be to cancel the merit acquired by the pilgrimage. At the Takar La (16,700 feet) I left the damp Tsari valley and re-entered that of the Char which we had left about a fortnight earlier. I descended to Sanga Chöling expending the last shot-gun cartridges on some pheasants and snow-cock on the road. Sanga Chöling is a large monastery and the seat of a very holy incarnation known as Drukpa Rimboche who was away at the time of our visit. I was very well received and entertained here.

I went down the valley to Char Me village, where I rejoined Captain Morshead, who had descended the valley as far as possible and had succeeded in going below the last Tibetan village. We then crossed the range into the valley of the Chayul, another branch of the Subansiri to the south; this we also descended as far as there were Tibetan villages. The road about here was bad, and we had to cross several narrow wooden

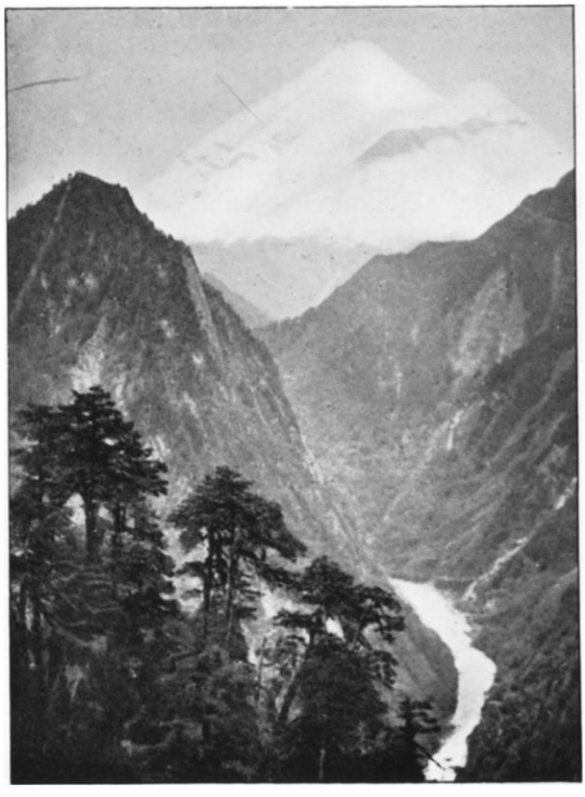
galleries and ladders. Every twelfth year a large number of Tibetan pilgrims go down the Tsari Chu below Migyitün and ascend the Char river to Sanga Chöling. The accounts given by pilgrims have enabled us to form an idea as to how these rivers flow after leaving Tibet and indicate that they reach the plains as the Subansiri.

In the villages about here we came across some parties of Daflas, the wildest savages I have ever seen. They had never heard of white people, nor did they know anything about India. Not only would they not accept money for their honey, the only thing of theirs that we wanted, but they appeared to be afraid of it, and to regard it as something noxious. The only articles they wanted were white beads and salt. They dress their hair in a curious way, tying it in a knot over the forehead, through which a brass or bamboo pin about a foot long is passed horizontally, and which is often surmounted by a tuft of palm-leaves. They had come over the snow range from the south. Near the frontier the valleys became more wooded, and just below, the country seems to become steeper, and tropical forest commences with great suddenness. In all these valleys which break through the range there is a curious gap of uninhabited country between the Tibetan villages and those of the Lopas, or savages (*i.e.* Abors, Daflas, etc.). The reason for this appears to be that the Tibetan cannot live much below 10,000 feet, while the half-naked Lopa cannot live at anything like that height.

We ascended the Chayul valley, and eventually turned up a branch of it, which is called the Black Loro on account of the dirty water, which looks as though it came from a glacier. On a hill above the junction of the Black Loro and the White Loro which unite to form the Chayul, Captain Morshead was fortunate enough to get a trigonometrical fixing on some snow-peaks which had been triangulated from India. His station happened to be the hill on which corpses are cut up and given to the birds in the Tibetan custom; seeing his party ascending the hill numbers of vultures collected only to be disappointed in their hope of a meal. Up the Black Loro we found a rather obstructive old man in whose house we stopped, and who asked us awkward questions about passports. Fortunately, in the evening we found a herd of bharal in the hill above his house and fixed the telescope on it, which so delighted his children, that the old man became quite jovial and friendly, and eventually gave us every assistance.

Two days' journey up the Black Loro brought us to the Pen La (17,330 feet), where we left the basin of the Subansiri, and reached a stream which found its way into the Tawang Chu, the waters of which reach the plains of India as the Manas. The stream at which we camped appears to break through the Himalayan range, which we crossed a day later at the Tulang La (17,250 feet). With the exception of where the Chayul and Char and the rivers of Tsari break through, the range runs in an unbroken line in a south-westerly direction from the high peaks near

GYALA PERI SNOW-PEAK.



LOOKING UP TSANGPO FROM BELOW PEMAKÖCHUNG, GYALA PERI, 23,460 FEET BEHIND.

LOOKING UP RAPIDS FROM NYUKDSANG.

KINTHUP'S FALLS FROM 100 FEET ABOVE.

TAWANG.

(*Photo by Capt. R. S. Kennedy, I.M.S.*)

Namcha Barwa, round which the Tsangpo bends, up to Gori Chen (21,464 feet), a peak east of the Tulang La. From here the range is more broken, but it appeared to us that from the Tulang La the main range went west to Bhutan.

On either bank of the Nyamjang Chu are two parallel ranges running north and south, both of which contain many peaks covered with permanent snow. The range which we crossed at the Tulang La runs into this, but becomes lower, and Nain Singh crossed it at the Mila Katong pass, 14,210 feet in height. We saw nothing of the country west of the Tulang La, and Nain Singh's report furnishes very little information. On descending from the Tulang La, we soon came to damp wooded country again, in the heart of which we found the curious and isolated district of Mago, having a population of about 200. The people are very different in appearance both from Tibetans and from Mönbas who live in the lower valleys to the south. They grow no crops, as their villages are too high (11,800 feet), in the damp climate, but they subsist on the produce of their yaks, which they exchange for grain. They wear peculiar clothes, and the women cover themselves in jewellery, mostly amber and cornelian, which is fastened to a silver plate on the head, and hangs down beside the ears and over the forehead.

From Mago we crossed a pass to Tse La (15,600 feet), which brought us into a tributary of the Dirang Chu, which itself later joins the Bhoroli. From our camp here we had a view of the plains of India for the first time for eight months. On this part of our road we passed numbers of people from the lower Mönba villages, bringing up grain and madder (*Rubia cordifolia*), a red dye which they exchange for butter and cheese with the Mago people. We saw blood pheasants (*Ithagenes*) here, but our interest in game birds had not been so great since the loss of our cartridges. After passing the village of Lagam, the people of which are similar to those of Mago, we reached Tembang, the first Mönba village in the valley of the Dirang Chu. We marched up to Dirang Dzong, the residence of an official, who concealed himself, and gave out that he was away in order to avoid the responsibility of stopping us or of allowing us to proceed. On our road we spent a night at Namshu village, where we met a party of Akas, a savage tribe who inhabit the valley of this river below the Mönba villages. From Dirang to Tawang we were on the route followed by Nain Singh in 1875, and were very glad of his survey as the weather hindered Captain Morshead in his work.

We were now on the main road between Tawang and India, and as far as the people knew we might have just come up from the plains; we consequently had great difficulty in obtaining food and transport about here, and the entire absence of money was another drawback; we now possessed nothing except three sovereigns, which were sewn in our clothes. At length, after great trouble, we managed to reach Tawang after crossing the Se La, which we found shrouded in mist, as did Nain Singh nearly

39 years before. Tawang is an important lamasery which rules Mönyul, the country of the Mönbas. We were here received with some suspicion, but on the whole well. We were taken before the Council, and sat at the base of a pillar in the centre of the council chamber while the councillors, 19 in number, sat all round the walls. The Mönbas are a people very distinct from the Tibetans and resemble more the Bhutanese or Sikkimese. They cut their hair short and wear a felt skull cap; they dye their clothes red, speak a different language, which is similar to that of Eastern Bhutan. The country they inhabit is lower than that in which Tibetans dwell, and we found them living at heights between 5000 and 10,000 feet, though there were very few villages at the higher elevation. The country is thickly wooded, and the rainfall is considerable. Their crops are those of similar altitudes in better-known parts of the Himalayas. At the time of our journey the chilli crop was being gathered and dried on the roofs of the houses, which made the villages appear to have scarlet roofs. We found the people using a yellow-flowered plant (*Hypericum uralum*) as a substitute for tea, and we were ourselves obliged to fall back on this for a few days. At Lunang in Kongbo we had found them using *H. patulum* for the same purpose. At Tawang we heard that the direct route to Tsöna, an important trading town to the north, was blocked by snow, and as Nain Singh had used the direct road, we were glad of an excuse to take a longer and unknown road.

On leaving Tawang, we marched down the valley, and turned up a large and hitherto unknown tributary, the Nyamjang Chu, which we ascended for three days, when we crossed the high range on its eastern bank by the Pö La (14,000 feet), and reached Tsöna. After crossing the pass, we left all trees behind and again entered the typical dry Tibetan table-land. At Tsöna we found two of our servants who had been sent to take over money from the head Ladaki of Tsetang, to whom we had sent a cheque. The weather was now, on October 23, at 14,500 feet, extremely cold, and we were thankful to have the means of buying blankets and clothes for ourselves and our servants. Tsöna is an important trading town at certain times of the year, and is the chief centre for the exchange of the produce of the low Mönba country for that of the higher parts of Tibet.

From Tsöna we continued our exploration in order to map the upper waters of the White Loro and the Nye rivers, which form the Chayul and eventually join the Subansiri. We crossed into the Subansiri basin by the Nyela La (16,990 feet); the country near by contained a good deal of game, and Captain Morshead shot two *Ovis ammon*. After completing the survey of the Loro valley to the point at which we had left it to go to Mago, we crossed the range into the valley of the Nye, each of us taking a different road. The passes we crossed were 17,200 and 16,800 feet in altitude. In the Nye valley we reached the Dzong of Lhöntse, the official of which governs the surrounding country. We mapped part of the upper waters of the Nye, and, after following Nain Singh's route

up a branch called the Sömpü for a short distance, we crossed the Hor La (17,680 feet) into the source of the Nyamjang river. The cold on the pass on October 30 was intense. The upper valleys of the Loro, Nye, and Nyamjang were very dry, with cultivation below 14,500 feet. The higher valleys are devoted to grazing, and we were told that wolves were very troublesome, and we saw the ashes of sheep-dung fires which are burnt in a circle round every camp to protect the flocks.

At the village of Gyao, at the head of the Nyamjang valley, was a small lamasery of five monks, who possessed a fine but absolutely neglected library. I counted roughly 1100 volumes, some of large size. After descending this valley we reached Dongkar Dzong, whence a road leads into Bhutan, which we had hoped to take, but owing to snow and other reasons we were not able to manage it. We continued down the valley, and at length came to the point where we had left the valley to go to Tsöna. The river below Dongkar flows through a remarkable gorge. In one of the villages here we had given some medicine to a small girl, who had recovered, and we were now, on our return journey, besieged by the sick of every village, to whom we gave some harmless medicines, and, we hoped, worked some faith cures. We crossed the Nyamjang Chu, near its junction with the Tawang Chu, by a bamboo rope suspension bridge, which had been made passable for ponies by placing several layers of matting on it and covering this with grass.

We descended the Tawang Chu to Trashigang, an important Dzong in Bhutan, which had been visited by Mr. Claude White some years before. Here we were royally entertained by the official, and were fortunate in coming just as a devil dance was commencing. In this part of Bhutan the crops include cotton, and the lac insect, which is planted out on trees, over which it spreads. From here we took five days to reach the railway. Most of our road was that used by Mr. White. Near the Indian frontier we had some trouble, as the road had been carried away by floods, and we were obliged to ford one stream thirty-two times in a day's march. Our last day's march was mostly over the plains of India, and part of it was done at night in a buffalo-cart. We reached Rangiya station at 2 a.m. on November 15, after a journey of about 1680 miles from Mipi, which is itself fourteen days' march from the railway opposite Sadiya.

The chief geographical results of our exploration were as follows:—

1. The mapping of some 380 miles of the Tsangpo, which had previously only been done by untrained or unreliable explorers.

2. The mapping of the lower course of the Nagong Chu.

3. The discovery of Gyala Peri, a snow-peak 23,460 feet in height, and of the glaciers on it, and on Namcha Barwa, the peak on the opposite side of the river.

4. By taking observations for altitude on the river where it breaks through the Himalayas some information regarding the enormous drop

in the river has been gained, and the falls reported to be 150 feet in height have been proved to be merely an exaggerated rapid of 30 feet.

5. The upper waters of several branches of the Subansiri have been discovered, and the fact that this river rises north of the Himalayas and breaks through the range in several places has been established.

6. In the area which Capt. Morshead surveyed were many snow-peaks, mountain ranges, and rivers. The two largest of the latter, which were previously unheard of, are the Chimdro and the Nyamjang. Several large towns were visited, and the size and importance of Tsetang and Tsöna had not previously been realized.

In addition to the geographical results, small but interesting collections of mammals, birds, and butterflies were brought back, among each of which were new species.

The PRESIDENT (before the paper): During the last fortnight the Fellows of this Society have been required to have very versatile minds. Within that brief space we have had to turn our attention first to the Antarctic, next to the South American river which Mr. Roosevelt described so graphically, where the man-eating fish live, and to-night we come to another region which is possibly more interesting than either—that of the borders of India and Tibet, where the great river, the Tsangpo, which flows through Tibet breaks through the Himalaya. Up to the present time there has been no certain knowledge of its supposed connection with the Brahmaputra of India. In that sense, perhaps, there is some link between this lecture and that of the last meeting: it serves to put another river on the map. The difference in level between the spot where the Tsangpo disappeared from our knowledge and that where the Brahmaputra comes within our cognizance in India, a matter of at least 5000 feet, naturally gave rise and credence to the legend of an enormous waterfall clouded in rainbow haze. I am sorry to say that in this case, as in others, travel tends to dispel romance, and we shall be told that this fabled waterfall reduces itself to a rapid some 30 feet in height. You will remember that some years ago, when Sir Francis Younghusband held Lhasa, all geographers had great hopes, in the first place, that the Dead Hand of China was to be taken off Tibet, and in the second place, that an expedition was just about to start from Lhasa to work out this problem of the junction of the rivers. Those expectations were disappointed. Decisions were come to in this country which this is not the place to criticize. Those decisions have had results of which we may hear something to-night. The Dead Hand of China was stretched again over Tibet, and this exploration, which then might have been made from the Tibetan side, has had to wait to be made from the opposite direction. Indian Survey parties have pushed up the rivers and have gone along the Tibetan border and revealed the manner in which the rivers and mountains are interlaced in that country. It is one of the most fascinating countries in the world. I have not visited this particular district, but I have seen a parallel district a few hundred miles further west, and if any country can be like fairyland—or what our imaginations of fairyland are—it is this region of the foothills of the Eastern Himalaya, where we find sub-tropical vegetation, forests gay with orchids, with glaciers, and superb snow-peaks flashing through their branches. It is not the least of the merits of this

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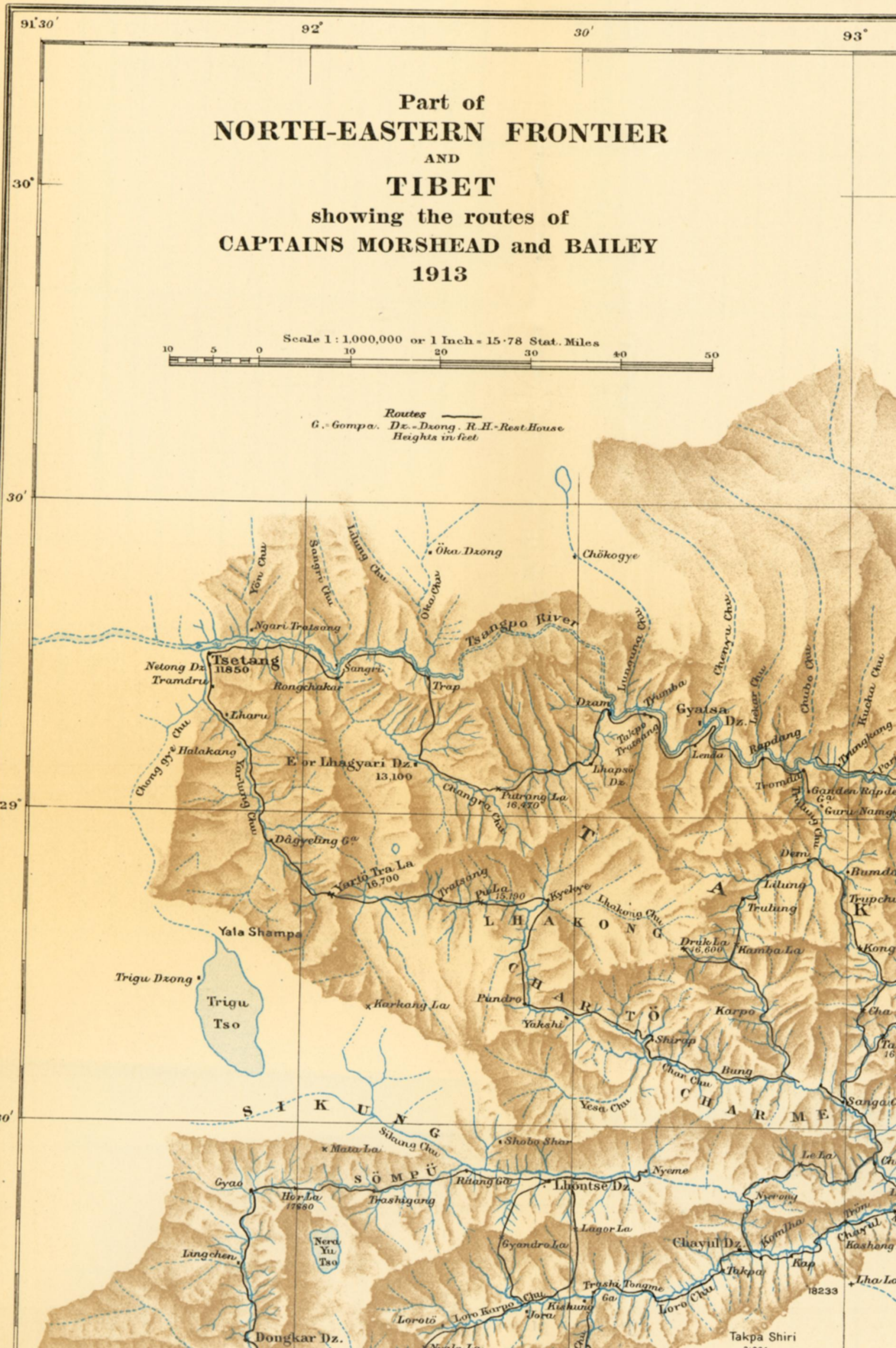
NORTH-EASTERN FRONTIER AND TIBET
MORSHEAD & BAILEY.


Part of
NORTH-EASTERN FRONTIER
AND
TIBET
showing the routes of
CAPTAINS MORSHEAD and BAILEY
1913
Scale 1 : 1,000,000 or 1 Inch = 15·78 Stat. Miles
Routes
G. = Gompa. Dz. = Dzong. R.H. = Rest House
Heights in feet
91°30′
92°
30′
93°
30°
30′
29°
30′
Öka Dzong
Chökogye
Yön Chu
Sangri Chu
Lilung Chu
Öka Chu
Ngari Tratsang
Tsangpo River
Tsetang
11850
Netong Dz.
Tramdru
Sangri
Rongchakar
Trap
Lharu
Halakang
Chong gyé Chu
Yarlung Chu
E or Lhagyari Dz.
13,100
Changra Chu
Putrang La
16,470
Dzam
Lunzhung Chu
Trumba
Takpo Tratsang
Gyatsa Dz.
Chenyu Chu
Lekar Chu
Chubo Chu
Kucha Chu
Lenda
Rapdang
Lhapso Dz.
Tromda
Trulung Chu
Ganden Rapden
Guru Namgye
Dem
Dāgyeling Ga.
Yartö Tra La
16,700
Tratsang
Pu La
15,190
Kyekye
Lhakong Chu
Liluing
Trulung
Yala Shampa
Trigu Dzong
Trigu Tso
LHAKONG
CHARTÖ
Druk La
16,600
Kamba La
Karkang La
Pundro
Yakshi
Karpo
Shirap
Char Chu
Bung
Yesa Chu
CHARME
SIKUNG
Sikung Chu
Mata La
Shobo Shar
SÖMPÜ
Gyao
Hor La
17880
Trashigang
Riang Ga
Lhontse Dz.
Nyeme
Le La
Lagor La
Nera Yu Tso
Lingchen
Gyandro La
Chayul Dz.
Takpa
Kap
18233
Trashi Tongme
Loro Karpo Chu
Kishung
Jora
Lorotö
Loro Chu
Dongkar Dz.
Takpa Shiri


93°
30'
94°
30'
K O N G B O
Nyang or Gyamda Chu
Tongk
Temo La
Temo G.
Shola
Tsela Dz.
Tse
Dowoka
Paka
Paka Chu
Lusha
Sungkar Chu
Trashi Rapden
Tokar
Pemtrong Chu
Lamdo La
Nayii
Yüsum
Nayu La
17430
Shoka La
Tsepa Chu
Pulung Chu
Trome
Kangsar
Gacha
Liilung
Orong
Tra tö
Chake
Chubo Chu
Kucha Chu
Trungkang
Pari Chöte
Nang Dz.
Ganden Rapden
Guru Namgye Dz.
Kongbonga La
Gön
Shu
Kyimdong
Kyimdong Chu
Liilung Chu
Tungu La
Surveyed by the Abor E
Sira Pateng R.
16550
P O
Bumda Sebum
Dem
Trupchuka
Kongmo La
17520
Lo La
PACHAKSHIRI
Chösam
Tsari Chu
TSARI
Chickchar
Pödzo Sumdo
17599
18056
Migyitün
9630
Cha La 16610
Yüme
Takar La
16,700
Drölma La
Shangu La
Tokpa Shiri
18813
Shagam La
Sanga Chöling G.
Siyom R.
Potrang R.H.
Yüme Chu
Le La
Charme
Dru
Lung
Karutra Temple
Chayul
Natrampa
Kashong La
Chupung La
Subansiri R.
Kap
18233
Lha La
T I B E T
90
95
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Batang


Tremo
Yigrong Tso
Tralung Chu
Dre
Gyadzong
Yigrong Tsangpo
Tangme
Trulung 6430
Dem
Satang
Kata ?
Po tö Chu
Nagong Chu
Tongkyuk Dz. 8340
Showa 8520
Po Tsangpo or Po Chu
Rong Chu
Gompone
Sengdam Pu 20700
Gyala Peri 23460
Pemaköchung Falls
Sü La 13445
Payü 7480
Sengdam
Lagung
Lunang
Gyala
Tsangrang
19180
Pango
Kemteng
Sayü
Nyima La
Namcha Barwa 25445
Temo La
Timpa 9680
Pe
Mönlam Sang
Temo G.
Doshong La 13500
17500
2610
Kapu
Chimdro Gompa
Chimdro Chu
CHIMDRO
Shola
Makti
Deyang La
Bungmo
Shümo or Yonggyap Chu
Pungpung La 14310
2620
Lusha La
Tamnyen La
Meto
17759
Rinchenpung
Yonggyap La 13020
Yonggyap Chu
Lamdo La
Mipi
Surveyed by the Mishmi Exploration Party
d by the Abor Exploration Party
Sira Pateng R.
DIHANG RIVER
iyom R.
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30°
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30'

Ngari Tratsang
Tsangpo River
Tsetang
11850
Netong Dz.
Tramdru
Sangri
Rongchakar
Trap
Dzam
Triumba
Gyatsa
Dz.
Takpo Tratsang
Lharu
Halakang
Chong gye Chu
Yarlung Chu
E or Lhagyari Dz.
13,100
Lhapso Dz.
Lenda
Rapdang
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Putrang La
16,470
Changra Chu
Ganden Rapden
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16,700
Tratsang
Pu La
15,190
Kyekye
Lhakong Chu
Dem
Lilung
Trulung
Bumdo
Trupchu
L H A K O N G
T A K
Yala Shampa
Druk La
16,600
Kamba La
Kong
Trigu Dzong
Trigu Tso
Karkang La
Pundro
C H A R T Ö
Yakshi
Karpo
Shirap
Cha
Char Chu
Bung
Yesa Chu
C H A R M E
Sanga
30'
S I K U N G
Sikung Chu
Mata La
Shobo Shar
Le La
S Ö M P Ü
Gyao
Hor La
17680
Trashigang
Riang Ga
Lhontse Dz.
Nyeme
Nyerong
Nera Yu Tso
Lingchen
Lagor La
Gyandro La
Chayul Dz.
Komtha
Chayul
Kashong
Kap
Takpa
Lha La
18233
Trashi Tongme Ga
Loro Chu
Loro Karpo Chu
Kishung
Jora
Lorotö
Dongkar Dz.
Takpa Shiri
21834
Nyala La
16990
Gyisum
Loro Nakpo Chu
Shio
22713
Karta
Rang
Tsöna Dz.
28°
Pendo
Me La
Chu
Trimo
Pö La
Pen La
17330
23054
Lepo
M Ö N
23192
Sen Chu
Le
Nyamjang
Tulung La
17250
Gori Chen
21464
M A G O
Mila Katong La
Pangchen
Dyuri
Shakti
Tawang
Tse La
15,550
Jang
Namsanga La
Tawang Chu
Se La
13,940
27°
30'
91° 30'
Beting
Y U L
Poshing
30'
93°
Yalang
Senge Dz.
Nyukmadong
Lagam
Namshu
Gamri Chu
Tembang
Konia
Trashigang Dzong
Dirang Dz.
Manda La

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MORSHEAD & BAILEY.

expedition that it has discovered one, if not two previously unknown snow-peaks, approximating to 25,000 feet in height. The expedition passed over 1500 miles of country entirely unsurveyed, and in great part unknown, though some of our Indian pundits may have visited parts of it. Its leader, Captain Bailey, who is here to-night to lecture to us, is a son of the late Colonel Bailey, R.E., of the Indian Forest Service, who was for several years Secretary of the Scottish Geographical Society. Captain Bailey has been for a good many years in the Indian Army and has done a good deal of interesting travel. He was with Sir Francis Younghusband in the Tibetan expedition, after which he joined Major Ryder and Major Rawling in their visit to the sources of the Brahmaputra. Some three years ago he made a still more remarkable journey from Peking south-west across China to the upper Yangtse, through a part of south-eastern Tibet which was very little known. For this he received one of the Society's awards, and lately in India received along with Captain Morshead what is called the "Macgregor Medal," an award given by one of the Indian Government Departments for any specially good piece of exploration. I think, therefore, you may be quite sure he will be able to give us to-night a very interesting lecture.

Captain MORSHEAD (after the paper): I have little to add to the account Captain Bailey has just given you of our expedition. I should, however, like to take this opportunity of paying a small tribute to the courtesy and hospitality with which we were met throughout the whole of our trip by the Tibetans. Much exploration still remains to be done in the heart of Tibet, and it is pleasing to be able to record for the benefit of future travellers the total absence of that mistrust of foreigners which has usually been so conspicuous amongst Tibetans. Throughout the whole of our expedition I adopted a policy of complete openness with regard to my survey, and I am glad to be able to record that no objection whatever was made to our working openly with the plane-table and theodolite. In fact, perhaps not our least discovery is the fact that it is now possible to traverse the country from end to end, openly, with plane-table and theodolite and without even the formality of a passport from Lhasa.

Sir THOMAS HOLDICH: Let me first say what a great pleasure it is to me to welcome the son of my old friend Colonel Bailey, so long Secretary of the Scottish Geographical Society, back again to England after his wanderings in the East. He has succeeded in unravelling a geographical knot which we geographers in India had looked at with longing eyes for many a long year; and he has disentangled it with an energy and determination and ability such as—well, such as we might have been led to expect from the previous records of this gallant young explorer. Incidentally he has disposed of the falls of the Brahmaputra, but there are just a point or two about that which I should like you to observe. He speaks of the god Shingche Chögye, who is concealed beneath the waterfall. Kinthup in his story speaks of the cliff Sinji—obviously the same, as it is over these cliffs that he reckons that the water falls 150 feet. Now, the Lama authorities whom Colonel Waddell consulted spoke, not of a god nor of the cliffs, but of a king-devil who was chained to the rock beneath the falls by the lamas, who belonged to the Tágpo type of demon. Now it is quite clear to any one that all these authorities refer to one and the same point, and we know now that this point is not actually in the bed of the Brahmaputra river, but closely contiguous to it. Perhaps it may be a matter of surprise that so comparatively small a natural feature as this should have exercised such wide attraction amongst Tibetans and the wild inhabitants of the lower valleys where the fame of it was known far and wide, unless we

remember that it is comparatively unique. There are no other falls. Many of us will remember, I dare say, a similar instance in connection with a mountain called Omi on the borders of China and Tibet, where it was stated that the devout worshipper might from the summit of the mountain occasionally see the image of his great teacher Buddha approaching the mountain. This story was widely circulated through the whole country-side, but met with very considerable scepticism on the part of civilized people, until one adventurous traveller who visited that mountain did actually see from the summit his own shadow cast by the sun on the mist gathering under the cliff on the edge of which he stood. Here was an explanation at once—an ordinary natural phenomenon magnified into a great portent, a phenomenon which may probably frequently be met with in the mountains of Wales or Scotland, assuming a magnitude in the eyes of the primitive people amongst whom it existed quite disproportionate to its real significance. So I am afraid we must give up any idea of magnificent falls in the Brahmaputra; but knowing and expecting that such falls might exist, that idea was doubtless partly due to our own imagination. I cannot find that Kinthup or any one else ever talks of falls in the actual bed of the Brahmaputra itself, and the modest height of 150 feet which he gives to them is nothing after all very great. We expected magnificent falls there; we know from what a height the Brahmaputra river descends to the plains. Consequently we expected them, and we are to a certain extent, I think, disappointed that we have not found them. However that may be, to my mind the vision of that important river sliding from plateau to plain through a series of tremendous rapids enclosed by gigantic cliffs, now and again extending into an open and placid river of a breadth which enables it to be accepted by Tibetans as a lake; still enclosed by mountains of extraordinary steepness, clothed from the river up to the sky with rhododendrons and firs—this seems to me to be a prospect quite as alluring as any that we might have met with had those falls existed. I can only wish I had been with Captain Bailey there to see. But we must remember that the great feature of Captain Bailey's exploration was not merely confined to geographical discovery. We should recollect that this part of the world is perhaps the fullest of any part of Asia of human interest. It is here we must expect to find the most primitive tribes, and here we must unravel some of the problems which are to be dealt with in studying the ancient history of humanity in Asia. Who are the Abors and the Mishmis and the Daflas, and those other illiterate and savage tribes who inhabit the buffer land between Tibet and India? And who, again, are those still more remarkable people who live in independent patches about Western China, whom we call the Lolos? We do not know, but we have at least, I am glad to say, expectations that in the course of a few months we shall know a great deal more about them than we know at present. Before concluding my remarks, I should like to refer to Captain Bailey's gallant colleague, the engineer and surveyor, Captain Morshead. I have had some experience myself in this matter of surveying with expeditions in that part of the world. I know what it is to be constantly on the watch for visions of peaks which are never free from clouds, to be looking for stars which never seem to appear, and to spend the rest of one's nights in computing from such sketchy observations as one may be able to secure. I assure you that the survey part of expeditions like this is by no means the least strenuous part of it, and it is to me a great matter for pride when I think how many officers there are of the Indian Survey Department who have been constantly engaged during the last fifty years in contributing to geographical science. East and

West, in every part of the world you may find them, in the field and at home equally, and I think we may accept it as a good omen, as a bright encouragement to explorers of the type of Captain Bailey and Captain Morshead, that the King has been pleased to bestow a high honour in to-day's Gazette on that prince of Indian geographers, Colonel Burrard, the Indian Surveyor-General.

Sir HENRY TROTTER: Perhaps I may be permitted to say a few words, as I have probably taken an interest in this problem of the Brahmaputra for longer than any one in this room. When I first went out to India fifty years ago the great geographical question of the day was: What became of the Tsangpo river? Some few years later, in 1874, when returning with the Forsyth Mission from Kashgar, I had the satisfaction of sending off Nain Singh, the famous pundit, on his well-known journey to Lhasa, and I recollect giving him instructions to proceed to Lhasa, a distance of 1200 miles from his starting-point at Leh, and thence to pursue a south-easterly course, and, if possible, follow down the Sangpo river to India. He got to Lhasa and struck the great river in a hitherto unknown portion of its course near Tsetang, in the north-west corner of the map. He fixed roughly the course of the river for about 30 miles below that point, but was forcibly prevented from following it any further, and returned to India from Tsetang by the same route that was recently followed by Captain Bailey's party on their way home, and I have this evening, to my great satisfaction, heard from Captain Morshead that Nain Singh's route survey was of great use to him, and had saved him a good deal of work, especially in bad and unfavourable weather. Various but unsuccessful attempts were made later on by the Indian Survey at different times to solve the problem. One Pundit succeeded in tracing the river from Tsetang to Gyala in about 95° long. in the north-east corner of the map, but his survey work was somewhat unreliable. Again, some years later another Pundit, A. K., was employed on the same quest, and, although unable to follow the Tsangpo, passed north and east of the point where the great river is now known to turn to the south, and, then proceeding by a long *détour* to the south, was able to prove that no big river passed through the mountain ranges north-east. This convinced the Indian authorities of the moral certainty that the Tsangpo did flow into the Brahmaputra, and not into the Irrawadi or even the Yang-tse Kiang, as had been conjectured by various authorities.

Another explorer, Kinthup, of whom you have heard a good deal this evening, was despatched from India with orders to cast well-marked logs of wood into the Tsangpo in the hope that they might be recovered in the Brahmaputra later on, but no success attended this experiment.

We must most heartily congratulate Captain Bailey (the son of a very old friend of my own) and his companion, Captain Morshead, on having successfully solved a most important problem of which geographers have been awaiting the solution for more than fifty years.

Mr. H. J. ELWES: Though the natural history of little-known regions is now beginning to be recognized as a branch of geography, Captain Bailey has from want of time told us nothing about his zoological discoveries in Tibet; and, as for over forty years I have been much interested in this part of the world, I think it is only fair to him to say that as a zoologist he has greatly distinguished himself. Several new mammals, including a goral and a deer, are included in the collections he has made, and he has also brought back specimens of a pheasant of uncommon interest. The late Lieut. Herman, R.E., who sacrificed his life by his exertions in exploring and surveying the frontiers of Sikkim, obtained from one of the Tibetan explorers whom he sent out, a

single imperfect skin of an eared pheasant, which I described under the name of *Crossoptilon Harmani*, in 1881; and though I suspected that this bird would be found in the lower Tsangpo valley, its habitat has remained unknown until now. Considering how many naturalists have endeavoured through native collectors to obtain a better knowledge of the fauna of these hitherto unexplored regions, it is remarkable that this bird has not sooner been rediscovered. Captain Bailey has also brought back valuable collections of insects, including several new butterflies, both on this and on his previous journey in eastern Tibet; and, having regard to the extraordinary difficulties of collecting on the march in such a country as this, I think he deserves the highest credit for it.

I hope this will not be his last journey in these countries, as I believe that his great success is mainly due to his knowledge of the Tibetan language, coupled with his courage and tact in dealing with people of such wild and suspicious character, and his ability to endure hardships which only those who have personal knowledge of the country and the climate can fully realize. Though Captain Morshead has modestly made light of the difficulties with which they had to contend, it is most encouraging to hear from him of the changed attitude which the Tibetans have adopted towards travellers, since they have learned that we are their best protectors against Chinese aggression. I therefore hope that a new era has now dawned on a country which, though in close contact with British territory for more than a century, has remained the least-known and most inaccessible region in the world.

The PRESIDENT: I am sure the meeting will wish to join me in congratulating Captain Bailey and Captain Morshead on the most remarkable piece of exploration and mapping they have carried out, and in thanking Captain Bailey for the paper. There are three or four points in his paper which has struck me, but what has struck me most of all is his excellent map. To any one who knows the difficulties of surveying, even in the crudest way, in that country, it is startling to find so much country covered in so few months, with such very admirable results. Again, it is news to us that Tibetans should receive Englishmen employed on a survey, which is generally an object of grave suspicion, with open arms. The "Forbidden Land" would appear to be no longer forbidden to Englishmen, at any rate as far as its inhabitants are concerned. Another point I may mention. At the time of the march to Lhasa, Tibet was frequently described as a bleak and barren desert. We have heard to-night of a region where there are fruit trees and cultivation and irrigation, and are towns of very respectable appearance where trade goes on. I do not know that there are any more remarks that I can offer, and I will now ask you to thank Captain Bailey for his very excellent lecture, which we shall be glad to follow more in detail when we have the map and the paper before us in the *Journal*, where I hope he will add some further account of the adventures and difficulties he overcame.

Stanford's New Map of the Greater Part of Europe extending from Moscow to the Atlantic and from the Gulf of Bothnia to the Mediterranean Scale 1 : 3,220,177. 2 sheets. London: Edward Stanford, Ltd. (1906 edition with Balkan boundaries corrected.) *Price* 21*s.*

Stanford's Map of Central and Eastern Europe showing the International Frontiers. Scale 1 : 3,220,177. London: Edward Stanford, Ltd., 1914. *Price* 5*s.*

General Map showing European Frontiers, 1914. Edinburgh: John Bartholomew & Co., 1914. *Price* 2*s. net.*

REVIEWS.

EUROPE.

'The Odd Man in Malta.' By John Wignacourt. (London: Chapman & Hall. 1914. Pp. 280. *Illustrations.* 7*s.* 6*d. net.*) The matter of this book accords well with its title; it is a fortuitous collection of brief essays on "Things Maltese." There is hardly a feature or phase of Maltese life which the author does not discuss. He treats of the people, language, local industries, amusements, excursions, churches, vehicles, antiquities, servants, hotels, etc., and even devotes a whole chapter to "Bells, yells, and smells." The treatment is undeniably scrappy, if entertaining, but the author's knowledge of Malta is so extensive and peculiar that the reader learns, almost in spite of himself, more about the island than nine out of ten winter visitors.

ASIA.

The Central Himalaya.

'Kulu and Lahoul.' By Lieut.-Col. the Hon. C. G. Bruce, M.V.O. London: Edward Arnold. 1914.

Colonel Bruce knows from personal experience more about the Himalaya than any other living man. He has explored the Khargan, the Karakoram, the Nunkun ranges, Kumaon, Gharwal, and now also the mountains of Kulu and Lahoul, which many persons know from afar off as a white wall, remotely visible from Simla. He pretends to care little about surveys and sciences, but, in fact, he cares very much at all events about topographical facts, and where he has been and told of his going there another can follow without doubt or confusion. He has a habit of meeting with physical misfortune which might prove more serious to a less powerfully built man, and his ill luck was not absent on this journey also—merely a dislocated shoulder this time, which would have sent most men home, but a few weeks later he is climbing once more. An unstudied vital narrative, he writes; dotted about with vivid phrases. The intense savageness of Zaskar, he says, "attracted me; there seemed to be nothing dull in its outlook nor tame in its desolation." It is a pity that he should borrow names from the Alps, but Todd's Giant is good and should stick, but not, one hopes, the Solang Weisshorn. Everywhere the strenuous, joyous, mountain-loving, entirely human personality of the writer comes plainly forth from his pen, so that the book is delightful to read from end to end. Besides, he has an experienced and sensitive eye for scenery, and when he passes from one kind of region to another he carries the reader vividly through the change. The great features all stand out, the rich valleys, the

mighty rock walls, the high pastures, the deserts—and then the mountains are not mere protuberances, but individual things, each with its own character, clearly distinguished one from another. It is only with points of the compass that he is a little vague—by omission, not inaccuracy, the common fault of travellers. The charm of Kulu, the impressive desolation of Lahoul, these are the main impressions a reader carries away from this book. He also derives a lively impression of the people; and the final chapter, contributed by Mrs. Bruce, with its appreciation of the flowers, the local life, the smaller beauties of every day, rounds off the book with a pleasing feminine note. Captain Todd's chapter, entitled "Some History and Folk-lore," is also a welcome addition to a useful and delightful volume, which is illustrated by good and truly illustrative photographs.

M. C.

The Tibetan Borderlands of China.

'Au Yunnan et dans le Massif du Kin-ho.' By Dr. A. F. Legendre. Paris. Plon, Nourrit & Cie. 1913.

Dr. Legendre had already made himself well known by his explorations in West Sechuen, and more especially by his travels in the Lolo country when, in 1910, he received instructions from his Government to proceed again to Western China. His mission was directed to carry out studies both geographical and commercial, including observations on Chinese sericulture, and also to obtain documents and copies of inscriptions to throw light on the interesting peoples who have hitherto either wholly or in part resisted the influences of Chinese civilization. Accompanied by Captain Noiret and Lieut. Dessirier, he left Yunnan Fu in November, 1910, and took a north-west route to the spot where the Tso-ling river joins the Yangtse south of lat. 28°. From there he made a series of excursions east and west across country left blank in Captain Ryder's map (*Royal Geographical Journal*, February, 1913) and unvisited by Leclere.* The journeys included a visit to the salt works at Pri-yen-ching. His description of the colossal corruption, official and other, under which the old system was worked is especially interesting from the light thrown upon the difficulties which face the reforms now taking place in the collection of the salt revenue.

After crossing the Yangtse, Dr. Legendre struck north to the valley of the Ngan-ning river and made several attempts to enter the Lolo country, most of which were foiled by Chinese officials, who sent troops to stop his way. An excursion to Chengtu was followed by detailed exploration of the country south of a line drawn from Ya-chou to Tachien-lu to the 28th parallel. There Lieut. Dessirier separately undertook the survey of the great bend made by the Yalung, first discovered by Dr. Logan Jack. The precipitous nature of the country made his task the more difficult and nearly cost him his life, which he probably owes to the devotion of his friend, who found him after he had been three days unconscious.

This part of China excited in Legendre, as in all other Europeans who have touched it, the deepest admiration for its beauties. The wealth of vegetation, park-like valleys, beautifully plumaged birds, and glorious views of snow-clad ranges as seen from heights of from 10,000 to 15,000 feet, are described with an

* Details as to various journeys of Dr. Legendre and his companions were given in the *Journal*, vols. **39**, pp. 72, 280; **41**, p. 384.

enthusiasm which almost drives out of sight the toils endured in mounting pass after pass in traverses at right angles to the line of the mountains.

Unfortunately the journey ended at the time when Sechuen was in the throes of the revolution against Manchu Government, and an attack made upon the expedition, when its dangers seemed all at an end, occasioned the loss of almost all the collections, notes and surveys. The travellers themselves were badly wounded, and one of the party, an Annamese boy, to whom the volume is dedicated, was killed. It is presumably owing to these losses that the map descriptive of the country is very imperfect, and makes it extremely difficult to recognize the routes followed. The "Kinho" is not marked as such on the map, but is presumably the Yalung river.

The volume is very brightly written and contains a great number of reflections on Chinese characteristics. It is somewhat of a surprise to find how unfavourably Chinese colonists are compared with the natives of the region, whose buildings, surroundings, and farming aptitude stand out in great contrast to the ruin wrought in the forests by the petty agriculture of the Chinese. Interesting remarks on the native tribes and their customs are scattered throughout the book and thrown into some shape in the Appendix.

W. R. CARLES.

'A Pepys of Mogul India.' Translated by William Irvine. (London: John Murray. 1913. Pp. x., 310. 10*s.* 6*d. net.*) This is an abridgment of Niccolo Manucci's famous 'Storia do Mogor,' of which an English version was published in 1907. The work of condensing the four bulky volumes of the original edition has been admirably done by Miss M. L. Irvine, who has produced a popular work, while retaining the distinctive features of Manucci's lengthy autobiography. The selections are made with discrimination and a due sense of proportion, while the continuity of the narrative of Manucci's adventurous life is not sacrificed. What has been omitted is that which appeals only to the scholar and the historian, such as the history of the interminable disputes between the Capuchins and Jesuits. In short, the editor of this abridgment has succeeded in giving a true and vivid picture of the famous adventurer and his amazing career.

'Pennell of the Afghan Frontier.' By Alice M. Pennell. (London: Service & Co. 1914. Pp. xvi., 464. *Maps and Illustrations.* 10*s.* 6*d.* net.) This volume forms an appropriate and complementary work to Dr. Pennell's 'Among the Wild Tribes of the Afghan Frontier,' published by the doctor a few years ago. The present book, though full of interesting incidents regarding the frontier tribesmen, partakes more of the nature of a biographical sketch of the author, and shows strikingly how his example and enthusiasm as a medical missionary inspired both his English friends and his native converts, pupils, and followers. He was only twenty years on the frontier, and died at the early age of forty-four. As Lord Roberts remarks, Pennell's fame as a physician and surgeon spread far and wide, and during one year in the Bannu hospital 34,000 cases were dealt with, and 1655 of these were admitted to the wards. In the same year 3000 operations were performed by four qualified medical men (two British and two Indian) and one qualified medical woman, figures which give some striking idea of the magnitude and importance of the work of the organization and execution of which Dr. Pennell was responsible. The profits of the present work, which has been written by Miss Pennell, as well as those of 'Among the Wild Tribes of the Afghan Frontier,' will be devoted to the Afghan Medical Mission.

country, the right maps and intelligence to use them, are among the first requirements of a soldier. That was a lesson we learnt—at great cost—in the Boer war. Of the three requisites Napoleon laid down for carrying on a successful campaign, the first was a knowledge of the geography of the seat of war. Sir John French's despatches show in a very marked degree this invaluable topographical sense, and we may feel sure there is no lack of it to-day among our officers.

I am glad to be able to say that the Society has in this respect been able to be of some use to the forces in the field. At the outset of hostilities the entire services of our staff were placed at the disposal of the War Office. They were cordially accepted and fully used. For several weeks work, which employed not only the regular staff but a number of volunteers, went on at Lowther Lodge. This work is still going on. Much of it has been brought to completion and put into use in the field, and we have received through Colonel Hedley very satisfactory testimony to the help it has given His Majesty's forces both on land and in the air.

DR. DE FILIPPI'S ASIATIC EXPEDITION.

DR. F. DE FILIPPI sends from Suget Karaul (Chinese Turkestan) the following account of the further scientific work of his expedition, from April 7 to the end of August, dated August 13, 1914.*

On April 7, after completing the geophysical observations of the Leh station, Commander Alessio, Prof. Obetti, Marchese Ginori, and the guide Petigax, left for Moré, on the Rupshu plateau, carrying the whole scientific equipment. I have mentioned before that we had decided to make a gravimetric station at Moré, although far out of our itinerary, because of the desire expressed by the Survey of India that the pendulum observations made at that spot in 1871 by Captain J. P. Basevi, with singular and unaccountable results, should be repeated. Although the pass leading on to the Rupshu (17,400 feet) was deep under snow, all the information obtainable at Leh had led us to believe that the plateau itself would be almost entirely free from it. When the party reached the pass, not without difficulty, a track having been previously made through the snow for the laden coolies, they saw to their dismay the whole vast tableland covered by a thick layer of snow, through which not a rock protruded. To proceed with the heavy baggage through 25 miles of deep soft snow was out of the question, and to beat a track through it seemed equally impracticable, so Commr. Alessio decided to give up the attempt and to return to Leh. A few days later Professor Dainelli also returned after

* See *Geographical Journal*, vol. **43**, pp. 32 and 672.

nearly a month's absence. He had gone up the Indus valley as far as Chumatang, whence he reached the Rupshu plateau in order to study its geology and morphology, which are particularly interesting owing to the glacial erosion, the closed basins, the salt lakes, etc. He found there winter conditions, a large amount of snow, and lower temperatures than he had experienced in the upper Baltistan valleys in December and in January. He then came back to the Indus valley, and followed it upstream to the Tibetan frontier. On the way back he skirted the Pangkong lake, and returned to Leh by the Vankse and Chang La road. In the latter portion of his journey Prof. Dainelli had also the opportunity of studying the anthropological characters of the Changpa nomad people in their winter quarters.

On April 29 we were joined by the second batch of members of the expedition: Prof. O. Marinelli, geologist; Prof. C. Alessandri, meteorologist; Major H. Wood, R.E., of the Survey of India; Mr. A. J. Spranger, topographer; and two surveyors, Jamna Pershad and Shib Lal, also of the Survey of India.

During the first half of May, the geologists made an excursion in the Zanskar district to investigate the Himalayan Tertiary. In the Leh district, besides making anthropological investigations, they ascertained the presence of considerable moraine depôts, the remains of a past glacial period.

During our stay in Leh, meteorological readings, pilot-balloon ascents and solar-radiation observations with Ångström pyrheliometer were regularly made.

At last, on May 15, the whole expedition started for the Karakoram, by the new road which is mentioned in the last report. On the fourth day we crossed the Kilas range over the Chang La (about 18,000 feet) in snowy weather, and next day we reached Shyok, a small village 12,100 feet high, the last inhabited place that we were to see for a long time.

We then went up the Shyok valley for eight days. The broad valley has a gentle slope, and is deeply cut between the Sasir range and the Chang-Chen-Mo and Lingzi Chang tablelands. Major Wood, Mr. Spranger, and the surveyors carried on a survey of the road while we marched up the valley. The snow and glacier melting had hardly begun yet, and the river was easily fordable, so that we were able to proceed along the flat stony bottom of the valley, and were spared the tiring ups and downs of the track which runs along the left bank of the river. Even so, the poor transport ponies and yaks suffered a good deal, owing to the lack of pasture. Fortunately we were able to replace some of them which became unable to proceed with picked animals from the caravans which we met on their way back from Depsang, where they had carried our supplies.

On May 30 we turned off from the main valley into deep and narrow gorges down which rushes a swollen and violent stream, and we arrived at the camping-place Murgo, where the new road joins the old Nubra-Sasir

road. Two more stages brought us to Kisil Langur, a short distance from the edge of Depsang, where all our supplies had been collected at the foot of a cliff, because the Depsang had been entirely covered with snow until a few days before.

The next day, June 2, we pitched our camp in the western and higher portion of the Depsang plateau, by the side of a small rivulet, the only permanent stream of the plains. This camp, at 17,500 feet altitude, formed our base for two and a half months. We had arrived there at the most favourable moment. Wide stretches of ground were still covered with snow or soaked with water, and a few days earlier we should not have found a dry spot on which to pitch our tents; while on the other hand, a short delay would have brought with it swollen and dangerous waters on our way up.

The Depsang is a huge terrace, swept by the winds day and night, covered with pebbles and minute detritus, entirely bare of vegetation. The Karakoram-Turkestan road runs through it, marked by a line of bones, skeletons, and carcases of horses, donkeys, and camels over which prey flocks of large ravens. In this abode of desolation Prof. Alessandri and Marchese Ginori spent two and a half months, collecting meteorological data, experimenting with pilot balloons, following them in their course with two theodolites at the ends of measured bases of various lengths, and observing solar radiation with Ångström pyrheliometer. Marchese Ginori also received the wireless time signals which were transmitted from Lahor twice a week for the regulation of our chronometers.

June was entirely taken up with the transport of supplies from Kisil Langur to Depsang, and from here to the advanced depôts for the survey parties. Meanwhile Commr. Alessio and Prof. Abetti completed the geophysical station, and Major Wood, with Mr. Spranger and the surveyers, remapped the plateau and the surrounding valleys, which are very inaccurately drawn on existing maps.

On June 11 Profs. Marinelli and Dainelli departed on a month's excursion to the upper Kara Kash and to the closed basins of the Lingzi Thang plateau. Their itinerary is partly through entirely unknown land. They made interesting observations on the morphology of the lake basins, and on the extent to which deposits had been carried eastward by the ancient Karakoram glaciers, and especially on the geology of this region, where rich fossiliferous deposits were found extending from the Palæozoïc to the Cretaceous.

About the same time Dr. de Filippi, with Major Wood, Lieut. Antilli, Mr. Spranger, and the guide Petigax, made a preliminary excursion to the front of Remo glacier, for topographical purposes and to find a way up to the glacier.

The real exploration work began on July 1. Our aim, according to the original plan, was to ascertain the position of and to survey the Indo-Asiatic watershed between the Siachen glacier and the Karakoram

pass. The Survey of India map of this district, drawn from sketches made in 1864–66 by Johnson, shows to the east of Siachen a group of glaciers which do not flow beyond the confines of the valleys where they originate. To one of these glaciers the name of "Remo" is given. In 1909 Dr. E. G. Longstaff, after completing the exploration of the Siachen, went up the Shyok river to its source and was much impressed by the appearance of the glaciers from which it springs. He was the first to surmise their importance and size, and the present exploration was entirely due to his advice and information. The results have quite justified his previsions.

The exploration was carried out by two separate parties. Major Wood, with Mr. Spranger and the surveyor Shib Lal, undertook the survey of the southern and northern aspects of the watershed between the Remo basin and the Karakoram pass; Dr. de Filippi, Commr. Alessio, Prof. Abetti, and Lieut. Antills, with Jamna Pershad and Petigax, went directly to the Remo glacier. There was some delay due to the difficulty of crossing the large and swift glacier streams and to a snowstorm which lasted two days, so that it was not until July 11 that the party actually climbed on to the glacier.

It took us one month to survey it, and we were greatly hampered by an unexpected obstacle—the persistent bad weather which prevailed over a vast area of the country through most of July and part of August. Notwithstanding this, Lieut. Antilli was able to secure a good number of photographic plates and panoramas, which will sufficiently illustrate the Remo. The glacier offers no difficulty whatever, and on our way up, before the advent of bad weather, we found it entirely free from snow up to the higher basins. The snow caught us in the high camps, at an altitude of 19,000 and 19,300 feet, near the upper circus of the largest branch of the glacier, and kept us there for eleven days, until the conditions, growing daily worse, forced us to a hasty return. Many of the coolies, although warmly clad, were frostbitten, some got snowblind, and each day the number of the invalids increased. The glacier was so much changed that it took us nearly ten hours to cover a distance that we had gone up thirteen days before in about five.

Profs. Marinelli and Dainelli, back from the Lingzi Thang, paid a visit to the Akfash and Kundan glaciers, which protrude from their valleys right across the Shyok, and have entirely closed the old Turkestan road. They found these glaciers practically unchanged since Longstaff's visit in 1909. They then traversed the whole of the Remo basin, and left it by a pass leading east, to the upper Yarkand river and the valleys explored by Major Wood's party. They then returned to Depsang over the Karakorum pass.

On August 13 the whole expedition was again united at the Depsang camp. In spite of the complications arising from the splitting up in so many parties, all the arrangements made for the transport, the supplies, etc., worked without the slightest hitch.

The exploration has proved the watershed range, the position and direction of the valleys, and the distribution of the glaciers to be entirely different from the representation in modern maps. The river Shyok originates from a single vast glacial basin, to which we have left the name Remo, although it is unknown to natives and has no meaning in any of the local languages. The Remo is formed by two large glaciers, a western and a northern one, which meet nearly at a right angle at the bottom of their valleys, and end at about 16,000 feet of altitude with a single common front, 300 feet high, which fills the whole width of the Shyok valley. These glaciers are 22 to 24 miles long, 2 to 5 miles broad; and the total area of the basin is about 240 square miles. To the east of the Remo the glaciers suddenly disappear, except for some insignificant single icefields, which makes the presence of such a vast glacial basin at the extreme limit of the Karakoram zone covered with ice all the more remarkable.

Both the western and the northern valleys are very wide, and rise with a very gentle slope up to the upper basins. The lower portion of the glaciers for several miles is thickly covered with huge ice pyramids and pinnacles of dazzling white, which at first may be taken for séracs, but which are only the result of melting. The geologists have observed similar formations, on an even bigger scale, on the Aktash and Kumelan glaciers.

The western Remo leads up to a vast amphitheatre of imposing mountains. The northern Remo, which is the larger of the two glaciers, flows between ranges not very high nor very impressive. It rises northward for about six miles, up to a sort of circus, where it bends to the north-east, to reach at 19,700 feet of altitude a basin so vast and so even that it has the appearance of a plateau. The glacier fills it to the brim, and appears to overflow between peaks which stand alone like islands in the ice. One of the cols, to the west, communicates with the Siachen basin, another, to the north, is on the watershed. It is much to be regretted that the persistent bad weather and the large quantity of newly fallen snow prevented us from actually reaching either of these saddles.

Into the northern Remo, or rather into the circus noted above, where the valley bends up to the north-west, flows a large tributary glacier from the north-west, which we followed up to the watershed ridge. This tributary, shortly before its termination in the Remo, bifurcates, and sends a short, but wide and thick, tongue through a deep cleft in the range to the other side of the watershed.

This singular fact becomes even more interesting through the result of Major Wood's exploration. Through a saddle to the west of Karakoram pass Major Wood and his party had entered a large basin of confluent valleys, which he identified as connected with the Yarkand river. The search for its sources had led him directly to this same tongue of the Remo glacier, and at the same time had given them the opportunity of connecting the survey work with ours. The small lake which Hayward, in 1868,

thought to be the source of the Yarkand is about 15 miles from the glacier, and has practically no part in the feeding of the river.

We have thus ascertained the most remarkable fact of one and the same glacier, the Remo, giving rise to the Shyok river, a tributary of the Indus, and to the Yarkand river, whose waters end in the deserts of Central Asia. This is only an instance of the general uncertainty of the watershed which we have encountered in the whole region, and which no doubt is intermediate between an ordinary range and the hydrographical conditions of the closed basins and indifferent watersheds of the Tibetan plateaus.

The Yarkand river, a few hundred yards below its origin, receives an important tributary which comes from a glacier overriding a saddle, and draining on both sides of it. Lower down the valley spreads out in a vast circus, where several tributaries join it. Major Wood went down-stream for about 60 miles, and ascertained the existence of two considerable western tributaries, which must flow from the northern slopes of the Karakoram, and which will be the object of the next exploration.

We had been several weeks without any news of the world, owing to an interruption of the road in the Shyok valley, when, on August 16, we received five European mails and, from India, the dramatic news of the conflagration which had broken out in Europe. England and Italy were said not to be entangled in it. Commr. Alessio and Lieut. Antilli thought it to be their duty to return at once to Italy, and Prof. Alessandri (an officer in the reserve), who had anyhow finished his work in the expedition, decided to join them. They left the next morning for Leh, intending to sail from Bombay. Their departure is a serious loss to the expedition, but we hope to finish our whole programme of work. Major Wood replaces Commr. Alessio as second in command of the expedition.

On August 19 a transport caravan of sixty camels and fifty horses, collected for us among the Kirghizes of Shahidula and Suget, arrived at the Depsang, and next day we left with all our things to cross the ranges into Chinese Turkestan. After crossing the Karakoram pass we again split up. Mr. Spranger with Petigax and the surveyors continued down to the Yarkand valley, taking with him most of the supplies. The rest of the expedition with the scientific baggage crossed the Suget pass (17,600 feet) and came down to the small Chinese fort at its foot, in the Kara Kash valley (13,000 feet).

Here, on the 26th, our party was further reduced by the departure of Profs. Marinelli and Dainelli, who returned home by way of Kashgar and Russian Turkestan. We are at present engaged in completing the geophysical station. We had little hope to receive at this place the wireless time signals of Lahore, owing to the distance and the number and bulk of intervening ranges; but they are perceived very distinctly every evening. The pendulum observations have just been brought to a successful close. There remain to be done the magnetic observation and the topography of

the place. All these researches are now entrusted to Prof. Abetti, with the assistance and help of Major Wood and of Marchese Ginori.

We shall leave Suget on September 4, and cross into the Yarkand valley over the Kirghiz Dawan. Major Wood will then go up-stream and join Mr. Spranger at Kufelang, to complete the exploration of the upper branches of the Yarkand. Dr. de Filippi, Prof. Abetti, and Marchese Ginori will follow the valley down-stream, and cross the Aghil range to explore the Oprang valley. Towards the end of October the expedition will be again united in the town of Yarkand, and will make the remaining geophysical stations according to the original plan.

THE GULF STREAM.*

By Commander W. W. CAMPBELL HEPWORTH, C.B., R.D., R.N.R.

1903 (Fig. 10).

Sea temperature, in the south-western portion of the North Atlantic represented by the 70° isotherm was above the normal in January, February, and March, and was below but increasing to the north-east. After March the sea temperature quickly declined except about the 50th parallel, where the 60° isotherm was well to the east of its average limit until after April. It exhibited fluctuations during the remainder of the year, but, except in the south-west arm of the ocean, continued chiefly below the average during the remainder of the year.

Air temperature at the three representative stations, above the normal until March, fell below in April, and remained below for the most part until the close of the year, except at Shields in October, when it was above in that month.

1904 (Fig. 11).

Sea temperature below the average in January and February, increased in March and April, then diminished, the 60° isotherm receding at least 11° west of its average limit at the end of June. After November sea temperature was not far from the normal, the 60° isotherm having been considerably to the east of the normal in September to November inclusive.

Air temperature at the three stations rose and fell as a rule in response to changes in sea temperature, but lagged markedly. Associated with the rise in the temperature of the latter, air temperature at Shields rose to nearly 3·5° above the normal in April and continued above until August.

* Continued from p. 452. The last sentence of the preceding instalment, p. 452, should read, " The salient features exhibited in each of the ten years 1903 to 1912 are as follows:—"

number of that Society's *Boletin* which contains the report of the meeting (Tomo 55, cuarto trimestre de 1913) gives also a translation of Sir Clements Markham's paper on Balboa read at this Society and published in vol. **42** of the *Journal*. A second and independent translation has also been published by the Geographical Society of Mexico. While the Madrid version is content with a prose translation of the well-known lines of Keats, quoted by Sir Clements, that printed in Mexico ventures upon a very good version in Spanish verse.

Gilchrist Studentship in Geography.—The institution by the Gilchrist trustees of a Studentship in Geography of the value of £100, to be offered annually to teachers of geography desirous of undertaking advanced work in the subject, was recorded in this *Journal* in 1912 (vol. **39**, p. 164), and the rules and conditions of the Studentship were printed in the same volume, p. 381. It is now announced that applications for the next award of the Studentship are to be sent to the Hon. Secretary, Geographical Association, 40, Broad Street, Oxford, not later than February 7, 1915. They must be accompanied by the necessary documents, as specified in paragraph 5 of the rules and conditions above referred to.

OBITUARY.

Lord Roberts.

By the death of Field-Marshal the Right Hon. Earl Roberts, V.C., K.G., K.P., O.M., G.C.B., etc., at the age of eighty-two years, the Society has lost one of its most distinguished Fellows; he had been a member of the Society for thirty-three years.

Although Lord Roberts was not often seen at the Meetings of the Geographical Society, yet he took an active interest in its work. During the time when he was Commander-in-Chief in India he was in constant communication with our then President, his old friend Sir Mountstuart Grant Duff, on matters concerned with the progress of geography, and in several cases he used his influence to further our objects and to remove, as far as was in his power, official obstacles to their fulfilment. Moreover, apart from the sympathy which he always extended to those engaged in any enterprise which demanded energy and resolution and which added to the general sum of human knowledge, he had

a close practical acquaintance with that phase of geographical activity which affected military progress, and a thorough appreciation of its value. At a time when most generals regarded the work of the geographer in the military field as a harmless effort to acquire scientific information which might finally be embodied in a map for the benefit of an inquiring public, Lord Roberts was the first (if we except, perhaps, Lord Napier of Magdala and Sir Michael Biddulph) to realize the practical value of a scheme of military surveying which could give good account, not only of the country traversed by military operations, but of that which lay ahead and on either side of the actual route of an army; which could map out a field of action whilst that action was in progress, and put into the hands of the commander the detailed plan almost as soon as the action was finished. No appeal was ever made in vain to Lord Roberts for the necessary military assistance to support a reconnaissance or to safeguard a working party to a distant point of vantage; he believed that map knowledge was as essential to strategy as it might prove to be to political counsels when a campaign was over. He understood a map thoroughly, and was convinced that the mapmaker was his best intelligence officer. In that belief he maintained that accurate geographical knowledge was by no means the least of the assets secured by a successful campaign, and he strongly advocated that survey officers should form an integral part of the Headquarters Staff on the field and should hold their own proper military rank as such. But Lord Roberts' views on military efficiency and preparedness were not always popular in India any more than they were in England, and he did not succeed. The military officer employed in making the maps necessary for the conduct of a campaign on the Indian frontier when maps were non-existent still ranked as a civilian scientist. This, however, never affected the results of effectual backing by the chief of the expedition, and it is mainly to Lord Roberts that we owe the comprehensive map knowledge that we possess of the great Afghan uplands beyond the frontier hills from the Indus to Kabul and the Hindu Kush. If Lord Roberts was not often seen in the hall of the Royal Geographical Society, this was due (as he has himself told me) to the great variety of his active pursuits in life and to want of time rather than to want of interest in geography. If not an explorer himself he was keenly interested in exploration, and nothing pleased him more than to discuss the results of the latest geographical expedition.

T. H. HOLDICH.

CORRESPONDENCE.

The Tsang-po.

61, Melville St., Edinburgh, October 9, 1914.

CAPTAIN BAILEY'S stirring and withal modest account of his and Captain Morshead's enterprising dash for the unexplored section of the Tsang-po will command the admiration of all those who are interested in the problem which these two gallant officers have done so much to solve. Albeit a short section of 30 miles of the river, including the location of its confluence with the Po-Chu, still remains to be explored, its course cannot materially differ from that immediately above, viz. from Gyala to Churung Chu.

In the *Geogr. Journal* of May, 1913 (vol. 41, p. 501), *sub* Correspondence, I showed by a tabulated longitudinal section of the Tsang-po from its source to the point of its emergence into the plains of India as the Dihong-Brahmaputra,

that in the then unexplored 85 miles from Gyala downwards, where it cuts through the Himalayas, the drop by a succession of rapids would probably be at the average rate of 52 feet per mile, or 10 in 1000. This is fully borne out by the survey figures which Captain Bailey, on p. 351 of his paper, gives of the section from Pe to Gyala, Lagung, and the confluence of the Chimdru, for the actual total drop in the 139 miles works out 7072 feet, equal to an average fall of 50·9 feet per mile, or 9·6 in 1000.

By way of comparison with the Alps, the nearest analogy, though of course on a smaller scale, to the stupendous V-shaped gorges eroded by the Tsang-po between Gyala Peri and Namcha Barwa, of which Captain Bailey's beautiful photograph facing p. 356 gives a most revealing picture, will be found in the upper Rhone valley, between the Dent du Midi and the Dent des Morcles below Martigny, where the Rhone, like the Tsang-po, has cut the main mountain range at right angles, the comparative figures being as follows:

	Tsang-Po.	Rhone.
On right	Namcha Barwa, 25,445 ft.	Dent des Morcles, 9700 ft.
On left	Gyala Peri, 23,460 ft.	Dent du Midi, 10,750 ft.
Aërial distance between summits	,, 12 miles	,, ,, 6 miles.
Level of river	,, 9,000 ft.	,, ,, 1500 ft.
Mean vertical depth of valley	,, 13,402 ft.	,, ,, 8725 ft.

The course of the upper Rhone presents another feature analogous to that of the Tsang-po in that its drop from the Rhone glacier to Martigny is 4240 feet in 80 miles, equal to 52 feet per mile or 10 in 1000, viz. almost the same average fall as that of the Tsang-po in the Himalaya section already referred to. The Tsang-po therefore does not materially differ from other rivers of an Alpine character which have cut their bed through mountain ranges at the point of least resistance. Shorn, not indeed of the beauty of its stupendous scenery, but only of the romance of its imaginary waterfalls, its course has proved to be a strictly normal one, interspersed with a series of rapids, as I, among others, ventured to predict.

Perhaps, in the sequel, Captain Bailey will be able to afford some information as to the nature of the rock-formations in the Gyala section of the river, and thus supplement his luminous paper.

There is in his expedition one important point which specially commends itself to the appreciation of linguists, namely, that his success, with his limited outfit and resources, was in no small degree due to his knowledge of the Tibetan language.

C. Du Riche Preller.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1914–1915.

First Meeting, November 9, 1914.—Douglas W. Freshfield, Esq., President, in the Chair.

Elections.—*Dr. Seymour Armstrong; Samuel David Bles; Arthur Bond; Captain N. P. Brooke (Leinster Regiment); Miss Susan Gearon; W. Howard*