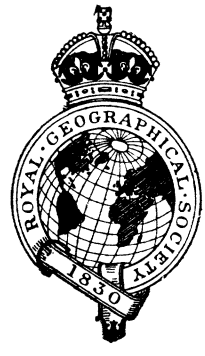
THE GEOGRAPHICAL JOURNAL



PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL.

EDITED BY THE SECRETARY.

VOL. XL.—JULY TO DECEMBER, 1912.

LONDON:

THE ROYAL GEOGRAPHICAL SOCIETY, 1, SAVILE ROW;

EDWARD STANFORD, LTD., 12, 13, AND 14, LONG ACRE, W.C.

1912.

PRINTED BY
WILLIAM CLOWES AND SONS, LIMITED
LONDON AND BECCLES.

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MAPS.

The figure 5709 in the Admiralty chart, which seems to refer to Sari Kiz, can hardly be right if it is meant for the highest point in the plateau. Speaking from a good many years' experience as a mountaineer, I feel confident that there is not so much difference between Baba and Sari Kiz as 71 feet. Schliemann's readings made it only 2·50 m. My own were taken from the second point of Sari Kiz and made it 30 feet. The highest point was certainly 20 feet above me and I am not sure that it may not be higher than Baba. The question is one which could hardly be decided without careful levelling. I have adopted on the map the respective heights of 5800 and 5790 provisionally.

The names of Sari Kiz and Baba (Gargara) are interchanged in Philippson. Whence comes the height of 1670 m. assigned to the former I do not know. It is in any case quite wrong.

I wish to express my thanks to Mr. Reeves for the trouble he has taken in working out and verifying these results.

A SUMMER EXPLORATION IN THE PANJKORA KOHISTAN.

By Lieut.-Colonel S. H. GODFREY, C.I.E.

IT is a curious coincidence that the only two unexplored portions of India should be situated at the southerly bends of two great rivers, both of which rise in contiguous highlands in Tibet, commence by taking diametrically opposite courses, and then break through the main chain of mountains dividing India from Central Asia, to discharge into Indian waters in the Arabian sea and the Bay of Bengal respectively.

The mountains and valleys on the right bank of the Indus as it turns south near the Tangir valley, and passes the southern watershed of the great range separating Gilgit and Chitral territory from the sources of the Panjkora and Swat rivers, are as unknown as the Abor country and the southern bend of the Tsanpo.

The expedition against the Abor tribes will probably yield geographical information of value and interest about their as yet unexplored country. It was a military expedition, that of 1908 against the Mohmands of the Peshawar district, which made it possible for an Englishman to penetrate to the Kamrat in the highlands of the Panjkora, a country hitherto unseen by even the Pathan conquerors of the Swat and Dir valleys. Both the Khan of Dir and the Dir levies and clans were exceedingly pleased with themselves at having successfully held their own borders without the aid of Government troops, and especially at the notice taken of them by Government.

The whole opportunity, therefore, seemed exceptionally favourable for a visit to that unexplored parallelogram within 72° to 73° 50′ E. long. and 35° to 36° N. lat., which includes the unknown watershed of the Panjkora and upper Swat rivers. Our maps of these tracts are still blank, although the celebrated Chinese traveller Fa Hian almost certainly followed the latter river in his visit to India.

On our arrival in Dir, delegates from the Kohistan brought down

word that they would be pleased to welcome me into their country, as their chief mulla, who at first had strongly urged them to resist my visit, had reconsidered his objections. Perhaps beyond the Indian frontier the magic word "inam" is as easily understood as "Bakshish" is in the valley of the Nile.

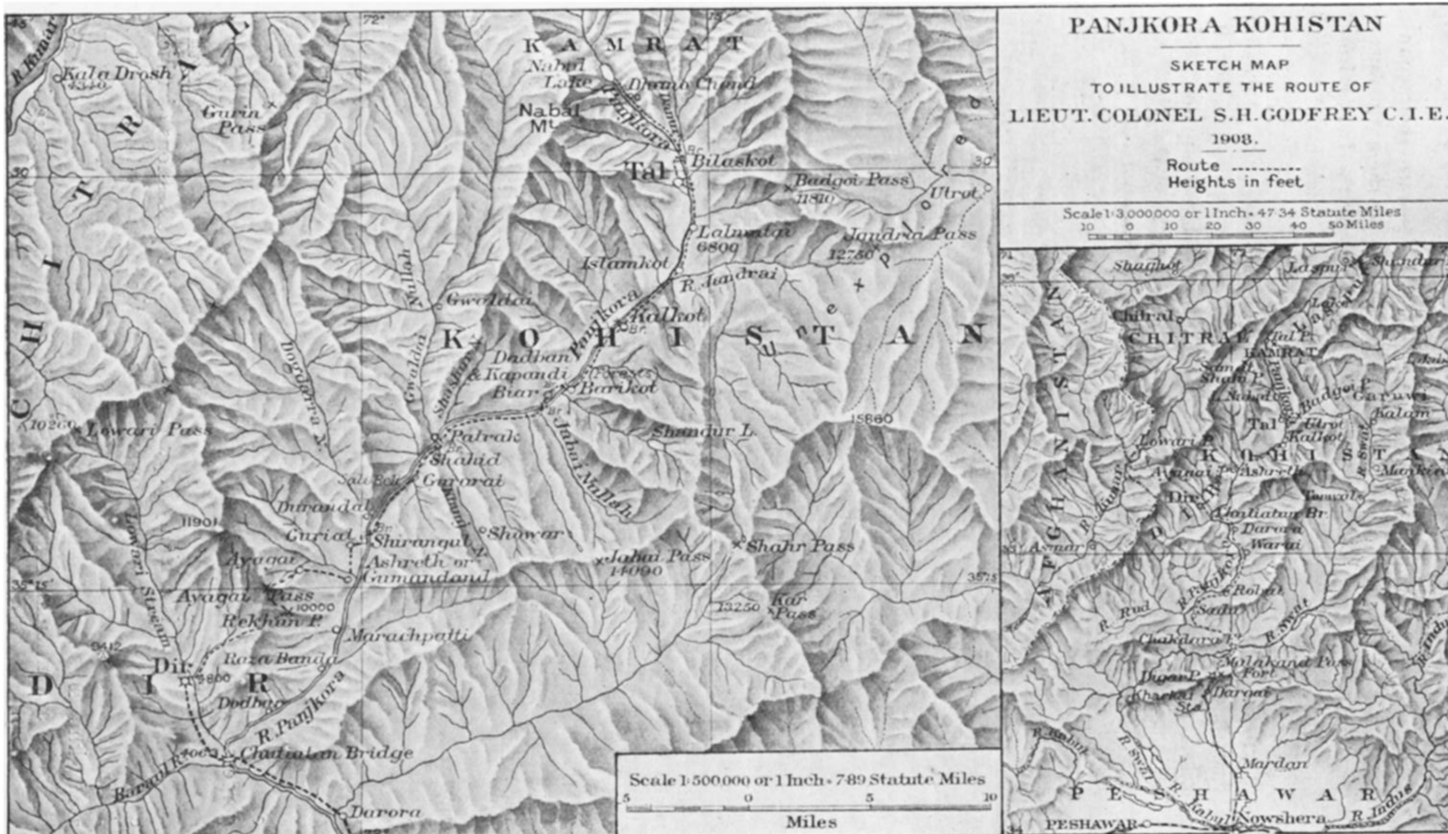
The road up from India to the Malakand pass and thence *viâ* Chakdara to Dir is fairly well known to many travellers, for it is followed every year by the troops which form the Chitral garrison.

The evening before our start for the Kohistan from Dir, there was a scene of wild rejoicings in the Palace of the Nawab. I had to present him personally with the "Sanad" or patent of his new rank conferred on him by Government.

At 6 a.m. next morning July 13, 1908, the camp was on the move. From Dir two roads lead to the Kohistan or highlands. One *viâ* the Chutiatan bridge and Dodbar village. The second, not yet visited by any European, *viâ* the Rekhun and Ayagai passes. The escort consisted of a body of well-armed retainers of the Nawab, and a strong guard of the Dir levies, a useful local force paid and superintended by a native assistant of the political agent. All were clearly given to understand by the Nawab and the native assistant that this visit was a friendly one, and that "looting" would be dealt with under tribal, not Government law, the former a far more primitive and much less mild code.

From Dir, a steep watercourse which drops into the Lowarai stream just above Dir is followed to the Rekhun pass. After the villages of Patti Basta and Raza Banda, Rekhun is reached. It consists of thirty-seven houses surrounded by extensive maize and wheat fields enclosed by walnut, mulberry, apple, and apricot trees. The hillsides are clothed with deodar and chir, the cedar and common pine trees, and water is plentiful.

From Rekhun the pass, probably about 10,000 feet elevation, is reached by a steep road, difficult in parts for mounted men to climb. From the summit the track descends steeply to Marachpatti village of some half-dozen houses belonging to Dasuis from Kohistan. The ascent to the Ayagai pass can be made by two routes, the lower, passable to footmen only and following the stream, the upper, used by mounted men and animals, winding up the spurs of the hill through very extensive forests until the Ayagai crest is reached in about an hour and a half from the Rekhun pass. The Ayagai pass is probably higher than the Rekhun. From tha Ayagai pass a magnificent view is obtained of the mighty range of the Swat Kohistan mountains, the gleaming snowfields of which feed the Panjkora river on the west and the upper Swat on the east. The Panjkora itself is not visible from the Ayagai pass, but the Panjkora valley is seen turning northwards among a maze of mountains into which dips a ravine known as the Gwaldai. This is covered with the deodar forests (*Cedrus deodara*) which supply northern India with its building timber, cut in the southern portion of the Kohistan and sent down to India


PANJKORA KOHISTAN
SKETCH MAP
TO ILLUSTRATE THE ROUTE OF
LIEUT. COLONEL S. H. GODFREY C.I.E.
1903.
Route
Heights in feet
Scale 1:3,000,000 or 1 Inch = 47.34 Statute Miles
10 0 10 20 30 40 50 Miles
Scale 1:500,000 or 1 Inch = 7.89 Statute Miles
5 0 5 10
Miles
KAMRAT
CHITRAL
KOHISTAN
DIR
Kala Drosh
Gurin Pass
Nabal Lake
Nabal Mt.
Dhamh Chand
Panjkora
Bilaskot
Tal
Badgoi Pass
11810
Utrot
Lalmatai
6800
Jandrai Pass
12750
Islamkot
R. Andrai
Gwaldai
Nallah
Kalkot
Dadban & Kapandi
Biar
Barikot
Dogdarra N.
Gwaldai
Shawar
Lowari Pass
10260
Patrak
Shahid
Gurorai
Shandur L.
15860
Jabai Nallah
Duramdal
11901
Curial
Shirangal
Showar
Shahr Pass
Jabai Pass
14090
Ayagar
Ashreth or Gamandand
Ayagai Pass
10000
Rekhan P.
13250
Kar Pass
Marachpatti
Lowari Stream
Dir
Raza Banda
Dodhar
R. Panjkora
Chutiatan Bridge
Baraul R.
Darora
72°
35°15'
Shaghot
Chitral
Lowari
Asmar
Dir
R. Rud
R. Swat
Chakdara
Malakand Pass
Fort
Dargai
Mardan
R. Kabul
R. Indus
PESHAWAR
Nowshera
AFGHANISTAN
R. Kunar

viâ the Panjkora river. A steep descent from the Ayagai pass leads to the village of that name about a mile beyond and below it. This village is situated at the junction of three streams coming from the range we had just crossed.

From Ayagai a steep rough track runs east to the junction of the Ayagai and Bar Ayagai nullahs at a great cliff on the right-hand side of the road. This cliff forms the boundary of Ayagai and Ashreth, a village entered at three-quarters of an hour's travelling from Ayagai. Ashreth, also known as Gumadand, lies in the northern side of the valley, and consists of a dozen houses only. From this place the road ascends to a neck, behind which lies Gurial, high above the stream, and reached at one and a quarter hours from Ayagai. From this hamlet the track ran over a rideable road to the last spur overlooking the main Panjkora valley, and from it could be seen the valleys of Shiringul on the right bank, and the Khunj Nala and Showar village on the left bank of that river. Shiringul was reached late in the afternoon, four hours after leaving Ayagai. Our modest camp was located near the ricefields, shaded by great chenar (plane) trees. Small Kabul tents were pitched for myself and the native assistant, while the levies bivouacked on beds of boughs with great-coats spread over them and their rifles piled beside them. All around, the mountains retain traces of the extensive deodar forests which formerly clothed the hillsides on both banks of the river, and which have been cut down by the timber dealers and sent for sale to India.

The village is interesting as the headquarters of a few families of Hindus, who pay a royalty for the monopoly of collecting ghi or clarified butter, for export from the Kohistan to India. Despite the fanatical character of the transborder, these merchants of an alien religion are safer in this wild land than the chiefs themselves. The Khans of Dir, like other Pathan and Afghan chieftains, would probably own cheerfully that the virtues of peace "have never been ours in a kingdom all stained with the blood of its kin, where the brothers embrace in the warfield and the reddest sword must win." Yet kindly commerce can certainly establish the claim for her humble Hindu votaries here, *Emollit mores nec sinit esse feros.* These traders are absolutely safe under the ægis of the tribal law and popular opinion, factors the strength of which are not perhaps fully understood.

The road leaving Shiringul for the north crosses a heavily timbered cantilever bridge to the ricefields of Shaur, and thence, entering a narrow gorge, follows the left bank of the upper Panjkora. At 1 mile distant from Shiringul, the Durandal village of the Dogdarra nullah is passed on the right bank. This is a highly populous location, the possessions of which extend to the hills above the Lowarai pass on the main Dir-Chitral road. After an hour's going, the gorge narrows, and the track winds steeply up a cliff known as "Gurgarina," an onomatopæic name locally explained as the noise a gentleman makes when falling down it. This place is one

of those natural positions, called in Gilgit and Chitral "darband," literally door closer, where "a thousand might well be stopped by three." This cliff forms the boundary of Dir territory in Shiringul with the Kohistan. The descent from the "Kharkharuppa" or cliff slide leads to Bar (upper) Gurarai. Here the two sides of the ravine are so shut in, that a dozen determined men might make the passage of the river difficult for any force. From Gurarai the road is slightly easier to Shahid (the martyr's tomb). Beyond Shahid the valley is still very narrow, and the torrent of broken green-grey waves is fringed with chenar trees, above which grow the Chilgoza (or edible pine) and such few deodars as the timber cutters have left. The hillsides are covered with brushwood and holm oak. From Shahid a stony path leads to Patrak, and down this a long line of white-clad figures, the elders of the Kohistan Jirgas, were seen descending to meet us.

Patrak, a large village of some five hundred houses, is approached by a good cantilever bridge spanning the Panjkora. It stands on a low fan with extensive cultivation on each side, at the junction of the Gwaldai stream and Panjkora river, and is the centre of the timber trade, and the headquarters of the agents of the Peshawar merchants who conduct it. The Gwaldai nullah bifurcates, connecting with the Dogdarra nullah and Lowarai pass by one branch, and by the other (*viâ* Gurin and the Samat Shahi pass), with Drosh, on the far side of the range here separating us from Chitral. It is in this nullah that the deodar timber-fellers are now busy. The Gwaldai route to Drosh in Chitral territory is not fit for pack traffic. The population of Patrak is Kohistani, governed by four head Maliks.

From Patrak the upward journey can be made by either the right or left banks, both being passable for laden mules with a little assistance in the steeper and narrower portions. The left is generally followed by the ghi and salt traders. It passes the Shashur nullah about 2 miles from Patrak through two formerly extensive forests named Dadban and Kapandi. Half an hour later the Jabai nullah is crossed by two strong wooden bridges, one of which spans the Jabai stream and the other the Panjkora river to Biar, a village of one hundred and twenty houses, surrounded with rice and other indigenous crops, all most carefully planted and tended. The clean condition of the Kohistani fields forms a marked contrast with the careless Pathan cultivation.

Biar is inhabited by Dashuis, who say they are representatives of six clans. The form of the village is now different, and quite unlike Pathan settlements. It is built, like all Kohistani villages, in long lines of houses terraced up one above another, the roof of the lower row of houses forming the verandah and courtyards of the row above. On these roofs the men, women, horses, and cattle of the Kohistan spend the greater part of their spare time. Our seats of honour on the roof of the highest row of houses were almost free from the ubiquitous fowls and

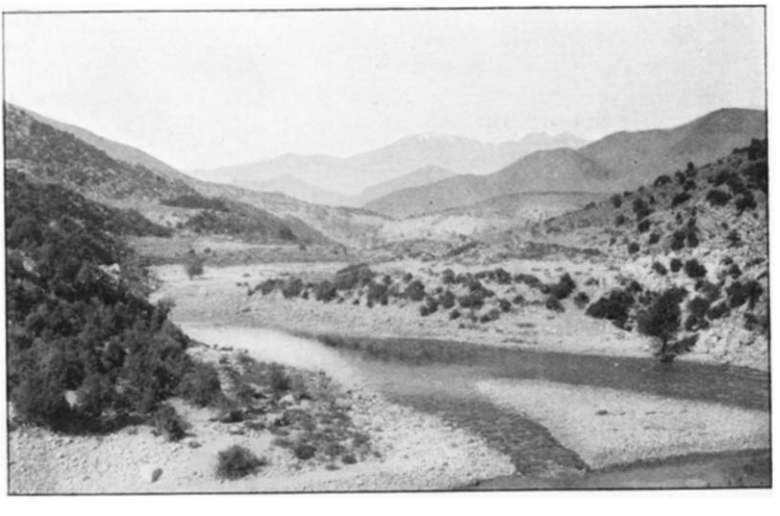
children, the former of which are perhaps the less active of the two. From Biar the better track passes along the left bank, although both banks are passable for mules.

Barikot is reached in an hour from Biar. It is situated on a high cliff on the left bank of the river, spanned by the usual strong cantilever bridge. These bridges caused some surprise to many of us. The cantilever principle was applied in the East long before it was adopted in the construction of the Forth bridge. But few of us thought the far north in India could show specimens of work which would compare so favourably with those of the Pathan. The Kohistanis's skill seems to show they are superior mechanics to the men whose ancestors deprived them of the lands they claim in the south. Above the terrace-built village a steep path leads up a cliff to the remains of an old fort. This, the villagers state, was held by their ancestor, Baria, a Kafir or unbeliever in Islam, who came from upper Swat when his village, Barikot, there was destroyed by the invading army of the Mohammedans eight generations ago. This story is confirmed by the traditions of the Yusafzais who now hold Barikot, in upper Swat, and who gave me a similar account when I visited them. The site of this old fort, of which the trace is plainly visible, occupies an exactly similar position to that of the now deserted houses and forts on the Malakand and Digar passes which connect lower Swat and Peshawar territory. Those houses and forts the Yusafzais of Swat can only now account for by saying that they were built by "Kafirs," and they closely resemble the many similar ruins in the Talash and Dushkhel valleys of Dir. There can be little doubt that the Kohistanis are the lineal descendants of the earlier inhabitants of the lower valleys in Swat and Dir, and it is noticeable that the Dashui Kohistanis still claim the Dushkhel country of Dir, now in possession of the Yusafzais, as part of their ancestral property.

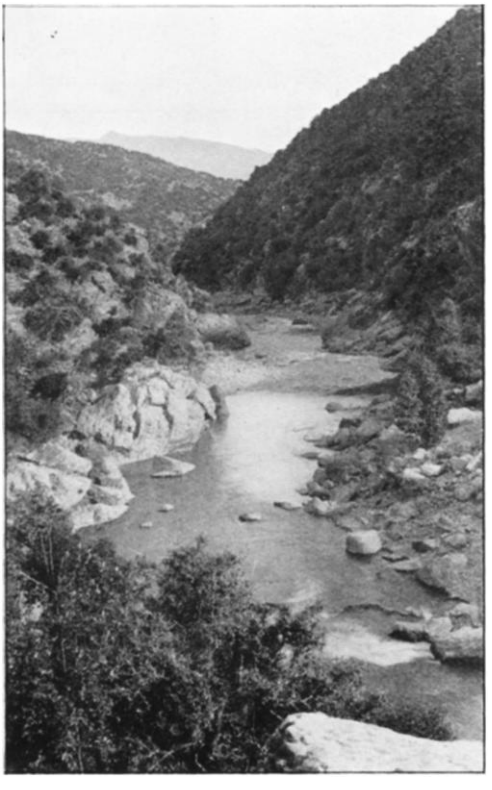
Leaving Barikot *en route* to Kalkot, the valley again widens, and there is extensive cultivation on both banks. Kalkot is a terraced village of about four hundred houses, and is about five hours from Patrak. By some of the other villages the Kalkotis are said to be of the Kalash tribe from Kafiristan, and their general physiognomy and particular uncleanliness of person seems to lend some verisimilitude to the story. But it is denied by the Kalkotis themselves.

From Kalkot to Tal, the capital of the Kohistan, a stony track crosses a precipitous rock-face in a narrow gap, where the Panjkora is again closed in by vertical cliffs, and rages down a series of steep rapids. A strong bridge spans the river near Kalkot. The hills rise abruptly for many thousand feet, with sparse jungle on the ledges and a few deodar trees. Half a mile further the track drops to a wide plain, bearing much cultivation and containing a few houses. The path now becomes obliterated, and the mules and ponies have to pick their way along the banks of watercourses and through the standing crops to Islamkot,

FORT OF THE KHAN OF ROBAT.



WARAI LEVY POST. THE PANJKORA RIVER IN FOREGROUND.



DEFILE BETWEEN DARORA AND CHUTIATAN.

DIR, SHOWING APPROACH TO THE LOWARAI PASS TO CHITRAL.

4 miles from Kalkot. Here a few houses occupy some high ground above land given by the Kalkotis as "Seri," or religious freehold, to the Palam Baba mulla, their spiritual guide. The way thence turns sharply to the left, and traverses some thick wood. Opposite this, on the left bank, the Jandrai stream joins the Panjkora.

Another half-mile brought us to the eastern debouchure of this Badgoi pass at Lalmutai, a large village of four hundred houses, built on high ground on the left bank of the Panjkora, near the Lalmutai ravine. Opposite Lalmutai the Tal plain is at length reached. At this point the character of the river changes almost as suddenly as that of the Jhelum above Baramulla in Kashmir. The ravine flood quiets down to a placid river, edged with willow and dotted with islands. The stream comes through a wide alluvial plain, enclosed by forest-clad hills which rise up to bare rocky peaks on either side. The beautifully kept fields are dotted with walnut trees, and the footpath is lined with wild indigo, jasmine, and half the flowers of Kashmir. The water-mills passed *en route* were all in full work.

The path winds on through the fields to a large cluster of chenar trees at the river's edge. Above it there is a mosque, having enormous deodar rafters of surprising length and thickness, black with the smoke of ages. Beyond this are tiers of houses running east and west, sheltering on the southern side only of a long spur which traverses the centre of the valley from the mountains to the river. This is Tal, the capital of the Panjkora Kohistan. It is by far the largest of the Kohistan villages, and contains above 1500 houses. Its cultivation extends as far north as can be seen on the right bank of the river. The fields and terraces on the left bank belong to Lalmutai. Popular rumour had said that the Talujis or people of Tal were of Arab descent. This tale was not confirmed by their own elders, who state that their ancestors came from upper Swat at the same time as Baria of Barikot. They also say their ancestors were named Lal, Sul, and Baratior, and they came to Tal about ten generations ago from Kanju and Damghar, places in the Nikpikhel country of Dir, and settled at Bilaskot just above Tal. The ruins of that settlement are still visible. The sons of these three men retained their original religion, but their grandsons were converted to Mohammedanism by Akhund Salik, whose descendants for many years took religious tithes from Tal. The descendants of these three are known respectively as the Marur, descended from Lal, the Silur from Sul, and the Baratior. The whole are still called the three families (drikhele). There are twenty shares in the villages of Tal, divided off among the descendants of the three families shown above. The language of the people is far more like Hindustani than Pashtu, the Pathan language, but has borrowed many words from the latter. The basis of their language appears to be Sanskrit.

The law followed is mostly determined by Shariat or Mohammedan

tradition. The marriage customs mainly follow those of the Pathans. The price paid to the parents for a wife is Rs.300 to Rs.400, and that to the heirs for a widow Rs.30. If a woman is taken in marriage without the previous consent of her parents or heirs, then the full price is demanded as "sharmana," or shame money. There is obviously no advantage in the latter course, except the saving in expense on a marriage feast and ceremonies. If the sharmana is not paid, then the party marrying the lady is held liable for dishonour, the penalty for which is death.

In cases of dispute between two Kohistani tribes, those two meet in conclave to decide the matter. If a Malik or headman dies, and his eldest son is fitted to succeed, that son inherits. If unfit, then the tribe appoints a substitute. The land divisions are well known. The rules of subordinate land tenure are simple. If a tenant supplies seed and plough and labour, he is called a nimkarayar (half-worker), and pays the landlord half the produce. If the landlord supplies everything needed for the cultivation of the land to the tenant, he is then called a "dihkan" (villager), and receives only one-quarter of the produce, three-quarters going to the landlord. The Kohistani tenant farmer is less well off in this respect than his distant Indian brother.

The elders of Lalmutai were kind enough to come across and visit me at Tal. They are Dashuis and related to the people of Barikot, Biar, and Patrak. Their ancestor, they state, was one Kain, and it is evident from the names given of his descendants that down to the third generation from him the people were not Mohammedans. Their forefathers, they say, came from Dushkhel and Swat, and were converted like other communities by Akhund Salak about nine generations ago. The ruins of the old "unbelievers," deserted houses in Dushkhel built of dressed and fitted stone without mortar, seem to confirm the tale, and also point to the probability of their ancestors being in a far higher state of civilization than the Pathans who displaced them. The Lalmutai boundaries with Shiu and Kalam in the Swat highlands are the watersheds of the Badgoi and Jandrai passes.

The camp at Tal was pitched on the roofs of the highest houses in the village, commanding a good view all round the valley. Here a great Darbar was held. The elders were at first very adverse to our visiting the Kamrat country beyond Tal, and produced many excellent reasons why we should not go there, and at last stated that their fear was the Pathans would harry their cattle.

As before, the native assistant, Khan Bahadur Abdul Rauf Khan, an hereditary Arbab of Taikal in the Peshawar district, was invaluable. His cheery laugh reassured the most doubtful, and his statement that the fame of their land would be increased flattered the vanity of the elders, while a present of sheep to them made a good dinner certain.

By collecting all the greybeards together so that they could check

each other's statements—which they frequently did—I discovered the local etymology of the present name of the river. Panjkor was, they say, their common ancestor. He had five sons. The descendants of the first three held Ayagai, while the other two came to Patrak and the upper Kohistan. The river was thus called Panjkora because its banks were claimed by the five sons of Panjkor, which means five houses. Their people had formerly occupied the Dushkhel and Talash countries in Dir, and the old houses still visible on the hill summits there were, they say, the houses of their ancestors. They also state that their ancestors were of one descent with the Bashgalis of Kafiristan. If there is any truth in this it tends to show that these highlanders were the descendants of the Buddhists of Swat, whose ancestry in Dir and Swat may go back to times far anterior to that of Fa Hian's pilgrimage to India. Local tradition evidently goes back to very distant ages. The Kohistani elders state that their ancestors used as weapons sticks hardened in fire. Subsequently they employed bows and arrows, and finally, when iron was discovered, axes and guns. Iron is even now worked in the Kohistan from the manganese-ferriferous sand washed down by the rivers. This is collected by the women, and smelted out with hand bellows made from goatskins.

By the time they were through with these accounts the local chiefs were so pleased with themselves that the start was fixed for the dawn without any further difficulties.

The Kamrat

From Tal northwards the path leads along the banks of irrigation channels and past carefully weeded fields to a cantilever bridge, known as Kalan, which spans the Panjkora at about 1 mile from the main town of Tal. Hamlets and mills are passed on either hand as well as large watercourses which feed the lower fields. Crossing the Kalan bridge the track continues through wheat, which was still uncut although mid-July was past, and leads to a second bridge, known as the Kamrat bridge, over which the way continues by the right bank. The Danur stream halfway between these two bridges is the boundary of Tal and Lalmutai. North of this the whole land belongs to Tal on both banks. It is known as the Kamrat, and is owned by the Talujis up to the watershed of the ranges separating this valley from those of Chitral, Laspur, and upper Swat. The forests on both sides of the river in the Kamrat become very thick, and reach down in places almost to the banks of the river, some of the deodars standing in the fields by the water's edge. Here the traces of the timber cutters have been left behind. After an hour's ride from Tal the hamlets of Dhano Chand are met on the left bank of the river. There is extensive wheat cultivation all round, and some twenty huts are scattered among the fields. Near the northern end of this village the right bank track is shut in by precipitous deodar-clad cliffs on one hand and the river on the other. The people have here constructed a stone wall and a

"gate." The object is twofold. It prevents cattle sent to the grazing fields from finding their way back to the cultivation, and enables a guard to dispose of thieves and travellers. At this point "hostis," the enemy or the stranger, are both turned back. The pasture lands and neighbouring forests have been kept sacred from Pathan and timber merchant alike. Englishman and Pathan, "we were the first who ever burst" into that unknown land.

Passing through the magic portal of Kamrat, we rode on over extensive grass plains and through magnificent deodar forests to the Purdin bridge, by which the road recrosses again to the left bank at $2\frac{1}{4}$ hours or about 6 miles from Tal. The plain at this point is very wide and flat, the extent of its level spaces being concealed by the masses of dense deodar fir and poplar jungle through which the path winds to "Dab," a verdant meadow with herdsmen's huts located at its edge. These shelters are occupied by those members of the families of Tal who go out in charge of the extensive flocks and herds which form the chief pride and wealth of Tal. This doubtless accounts for the absence of youth and beauty noticeable at Tal on our arrival.

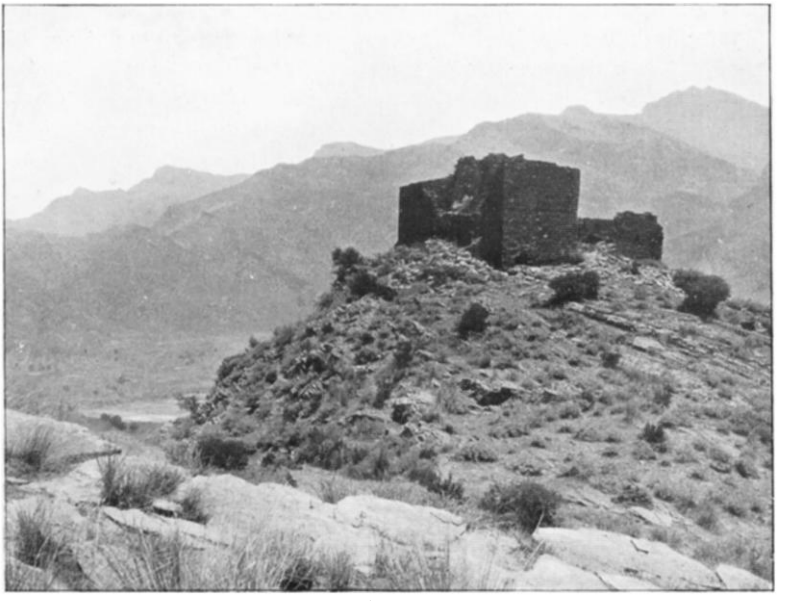
After another stretch of deodar forest, the Loi Dab or great plain is reached about 9 miles from Tal. This is an extensive "Marg," or runnymede, from which cattle are prevented from straying by a second gate. Cattle were grazing freely everywhere, tended by boys and young men, who seemed to live like Krishna amid pastoral surroundings and in a perfect climate. Word having been passed by the elders that they need not fear a raid they turned out and gave the interested audience a theatrical representation of an old theme, the mistake of May marrying December, and a country dance.

Three boys were dressed up, one as a pretty young girl in bright-coloured clothes, one as an old man in a rough homespun cloak and sandals, the husband of the former, and the third as a young man in very gay-coloured garments. The old husband, sword in hand, endeavoured to prevent the young man from paying too marked attention to his youthful wife. The *dénouement* was not that of vice vanquished and virtue triumphant, for the young man finally possessed himself of sword and bride alike, to the immense delight of the Pathan spectators, who applauded the performance enthusiastically.

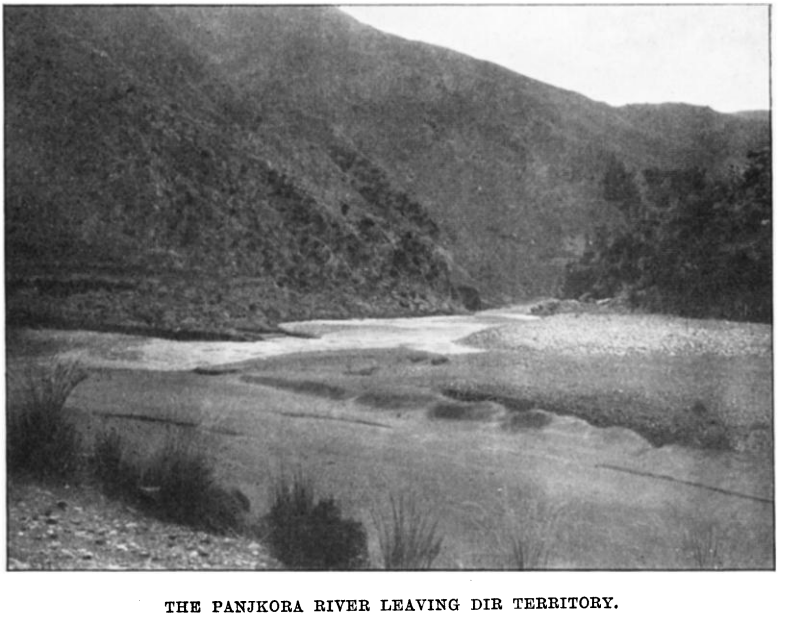
The Kohistan Maliks who accompanied me explained they had only four summer months, and therefore divided the whole of their grazing lands into two parts, allotting two months to each, so that the grass was never wasted or spoilt.

After leaving this meadow the road dips into another great deodar forest, but now instead of being level it commences to ascend. The forest becomes quite primæval. Enormous trees lie exactly as they have fallen, swept down by wind or avalanche.

Young growth is noticed wherever there is sufficient space. Tributary



BUDDHIST TOWER IN SWAT.



THE PANJKORA RIVER LEAVING DIR TERRITORY.

waterfalls are visible on both banks of the main river, and the level of the road is very little below that of the lower glacial snow in the lateral valleys running down from the Nabal mountain on the right bank. Beyond this point for the first time the track is almost impassable for animals. A vast cliff rises up on the right hand, bare as a wall on its face, but crowned with groups of deodar. The river, instead of meandering along in a placid stream, becomes a cataract, and then as the foot of the Nabal mountain is reached a strange transformation suddenly occurs. The deafening torrent appears to be pouring down among the broken stems of huge trees interspersed with enormous boulders and other *débris* of a great landslip, as it indeed is. After a long ascent there is no longer any river visible, only a silent lake. A fragment of the Nabal mountain, it appears, slipped some years ago, blocked the exit of the valley, and has formed a vast dam athwart the Panjkora. At the upper end of the lake the topmost branches of submerged trees peep out from under the surface of the placid blue waters. The former track has, of course, been buried, and a path has to be picked among the boulders of which the hillside consists. North of this lake there is no permanent habitation, nothing but swamp and marsh, glacier and mountain, until the Tal pass is crossed leading down into Laspur, which lies at the foot of the Shandur pass, connecting or rather separating Gilgit from Chitral. The Tal pass is never crossed in winter, and during summer its passage is always made at early dawn from fear of the falling stones which are loosened by the sun directly a thaw sets in.

Sitting at the quiet margin of this sheet of water taking a modest lunch of sandwiches and wild strawberries while the elders of the people and the escort were at their afternoon prayers, it was impossible not to reflect on the potentiality of the vast power scheme which nature has created here with a single careless touch of her finger. All around are forests, half as old as time, valueless at present to the Talojis. But their real wealth may be shown in a sentence. The timber merchants working in the districts below Patrak pay five rupees per tree—some six shillings and fourpence each. These trees are cut into logs about four to the tree, and each of these logs, carried down the Panjkora in flood time at little or no cost, are sold in Nowshera on the North-Western Railway for some thirty rupees or two pounds a piece. There is a fortune in the rough timber alone, yet the great dam we had just passed seemed to murmur in the distance of the power that it could transmit to turbines and saw-mills, and of the return it could make to the Government for all the life and treasure that have been spent in bringing peace to the war-tormented valleys of Dir and Chitral.

No European or Pathan had ever looked on this quiet scene. Even the great Umra Khan of Jandul, who was the cause of the war of 1895, and the siege of Chitral, and whom it took the might of the Indian Empire to drive out, an exile to Kabul, only penetrated as far as Tal,

which he captured and burnt, sparing the mosque. Intensely superstitious, he was afraid of the great marshes said to exist in the Kamrat, where he feared to lose his beloved horses, through the hostile agency of the "fairies" which dwell in the secluded valleys of this mountain land. The story of Umra Khan and his adventures as far as Tal as told by the Kohistanis was confirmed subsequently by an old warrior of the Mamund tribe from Bajaur, who had accompanied Umra Khan to Tal, and who recounted the whole tale to me at the Malakand.

The elders of the people now offered to conduct me by the Badgoi pass to Utrot and Kalam, at the head of the Swat Kohistan. They said they had heard from Kalam that three years ago I had received the son of their head Malik courteously at Malakand, and were therefore willing to undertake the responsibility. This was perhaps really the most flattering reward of six years' service "across the border" that could have been hoped for, but it was getting time to return.

The visit had at least demonstrated the existence of a road, however bad, other than the Chitral route, by which Gilgit could be reached from Dir and Swat *viâ* the unknown hinterland at the head of the Panjkora and upper Swat valleys.

If I read aright, the real object of the Kohistanis in permitting a British officer access to a valley, hitherto so secluded that even Gujars or herdsmen from Laspur were blindfolded when taken through it, then their motive was one of self-protection, against a dimly perceived end, and a hope that a power greater than that of Umra Khan may preserve their grazing-grounds and their autonomy.

The return journey was accomplished without any incident beyond an accident that ended happily. The treasure mule, escorted by its armed escort, fell from the cliffs into the river, and five of the Dir levies sprang into the torrent after it fully accoutred. When asked afterwards if they could swim, their reply was characteristic. No, they said, but if the mule had been swept away, who would have believed that the treasure had been really lost.

After leaving Tal on the return journey, a party of horsemen were seen ascending the river. This was headed by the Khan of Robat, a place shown on the map many marches to the south. He said a report had reached his country that our party was besieged by the Kohistanis in Lalmutai, and he had ridden night and day to our relief, and his men were following. It was a kindly action, based on long personal friendship, and his services to Government dating from the troubled times of 1897.

From Patrak the Panjkora route was followed back throughout, and about a fortnight afterwards the party broke up at Chakdarra *en route* for the Malakand.

It only remains to add that the behaviour of the escort of Dir levies and the Nawab's retainers was perfect.

My sole regret was the impossibility of using instruments or taking photographs in the Kohistan itself, which might have made my paper of scientific interest to the Royal Geographical Society. Now that confidence has been established and the veil at least partially lifted, it may perhaps remain for a more fortunate successor to provide data concerning the Kohistan which shall be of really scientific value without incurring the risk of involving the Government in the expense and trouble of a "little war" over some trifle such as a deceased political agent.

For the photographs taken in Dir and Swat I am indebted to Major Rich, R.E., Captain E. S. C. Willis, D.S.O., 58th Rifles, Frontier Force, and Lieut. Preston Thomas, R.N., the latter of whom wrote for the Admiralty a naval lecture about the southern portions of Swat and Dir.

NOTE.—The map which accompanies this paper can only be considered a rough sketch. It has been drawn from a tracing supplied by Lieut.-Colonel Godfrey, supplemented by sheet No. 27 N.E. of the North-West Transfrontier Series of the Survey of India, on the scale of 1 inch to 4 miles. The tracing is taken from the same series of Indian survey maps, with the route of the expedition and new topographical information added.

CLIMATIC AND ECONOMIC CONDITIONS OF NORTHERN MANCHURIA.

By ROBERT T. TURLEY.

THE question arises in the minds of many as to the future of the Chinese race if the new *régime* will open a brighter era for that people. It is hoped that, as in India, the population will quickly increase, and not remain, as it has been for centuries, apparently stationary, owing to unchecked epidemics, terrible famines, and frequent rebellions, all causing a tremendous loss of life.

It is now known that there are large areas of land in China itself that could be made to support many millions more people, but China must look to the vast regions of eastern Mongolia, with its present very sparse population of nomads, and its magnificent heritage in Manchuria.

Profs. Parker and Tomhave, who were lent to the Chinese Government by the Bureau of Agriculture of Washington, U.S.A., made some careful reports, and I have myself, for many years, studied the general condition of the north-eastern dependencies of China outside the Great Wall. There is no doubt that these regions can easily support one hundred million people, exporting much food-stuff as well, instead of less than twenty millions as at present. The Chinese are particularly good as cultivators of the soil, but they need a few new methods and seed corn suitable to special conditions.

Already large tracts of eastern Mongolia, which were not long since

Suggested abbreviations (specimens only).

Single letters never represent countries.

R = the rest. H = Home supplies.

Ag. = Argentine	In. = India
Ah. = Austria-Hungary	It. = Italy
Au. = Australia	Mx. = Mexico
Be. = British Empire	Nz. = New Zealand
Br. = Brazil	Ne. = Netherlands
Bu. = Burma	Pu. = Peru
Ch. = China	Uk. = United Kingdom
Cn. = Canada	Ur. = Uruguay
Cy. = Ceylon	Us. = United States
Fr. = France	Vz. = Venezuela
Ge. = Germany	

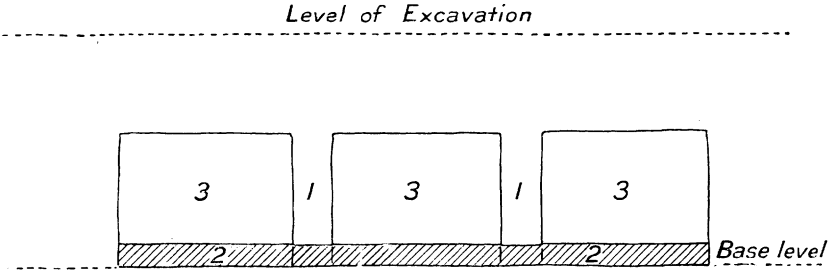
ON THE WATER SUPPLY OF HILL FORTS IN WESTERN INDIA.

By F. J. VARLEY.

THE hill forts of Western India are mostly situated in commanding positions upon the summits of the western Ghats, and other hill ranges, which intersect the hinterland. The forts in the interior are often placed upon isolated hills, which rise up in a conspicuous manner from the general level of the tableland of the Deccan, and the plain of Khandesh. Historically it may be shown that they are strategically well placed to defend lines of communications and trade routes, or to serve as strongholds dominating wide tracts of level plain.

In character they vary considerably, from the elaborate hill forts such as Partabgarh, Raigarh, Asirgarh, and others to the small forts placed on isolated hills, of which Laling and Songir in Khandesh may be taken as examples. The summit of these hills is usually a plateau varying in extent from a few acres up to several hundred acres; the edge of the plateau terminates in a nearly sheer wall of rock or scarp, from 100 to 300 feet high, and this scarp only requires very slight fortification to render it impregnable against any assault. In the case of the larger forts there are two or more lines of artificial fortifications lower down the hill, which serve as lines of defence to the main fort on the summit. Through these lower fortifications, by means of gateways and zigzags, is led the path which gives access to the summit, the final approaches to which are sometimes of the most complicated and stupendous construction: for instance, the approach to the summit of the far-famed Fort of Davlatabad is led by a series of spirals carved out of the solid rock, and placed entirely within the rock-surface of the scarp.

It is not the purpose of this paper to enter into the very interesting questions connected with the history of these forts, or the traditions relating to their early occupation. Many of the forts are in an excellent state of preservation still, but the majority are fast disappearing under the stress of successive monsoons and neglect to effect any repairs. Now, it is obvious that the expedient of digging wells within the area of these hill forts cannot be resorted to, the geology of the region in which they are situated showing a uniform layer of trap rock which covers such a vast area of India to a great depth. Springs can only exist on the plain, where percolation through the fissures of this most impermeable stratum is alone possible. This fact was well known to the builders and occupiers of these hill forts, who knew that an adequate supply of water situated upon the hill itself, within the area of the fortifications, was a prime



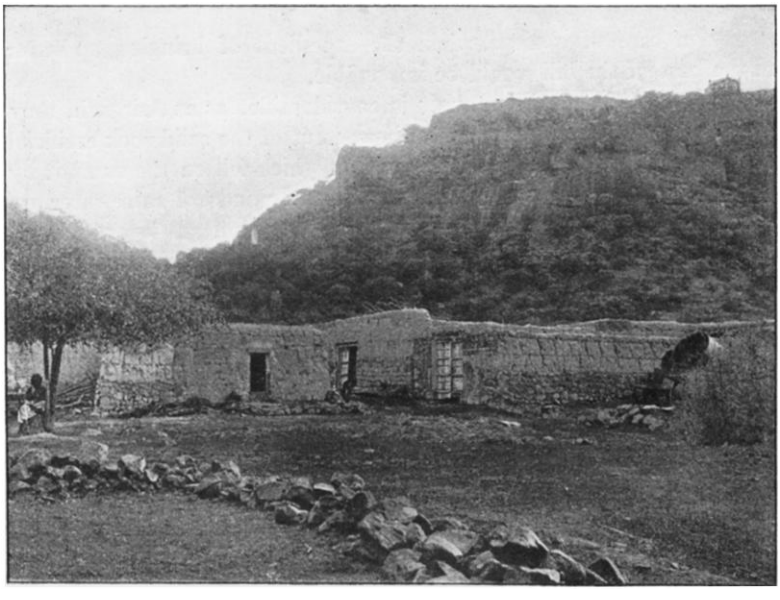
1. Rock pillars
2. „ ledge
3. Openings to interior of Cistern.

PLAN A.

necessity in case of a siege, when the expedient of bringing up water from the base of the hill would be impossible.

Where the area of the summit is considerable, as at Asirgarh, they improved any natural depressions, or hewed out of the solid rock artificial depressions, and collected in them the rain which fell on the summit by means of very carefully devised drains. These ponds of rain-water are known as *talaos* (or tanks). At the small and unimportant fort of Songir, the area of whose summit is very small, a most remarkable square hole has been cut in the solid rock, the labour involved being incredible. I measured the dimensions of this *talao*, and found it to be 66 feet × 63 feet, with a depth of no less than 70 feet, which is about the height of the scarp of this fort. It might appear at first sight that this was labour thrown away, but as the hill does not from its construction admit of any outer defences, the plateau would have to be held, if at all, on the water collected upon it, and it is a primary objection to these shallow *talaos* that the water dries up. Consequently the defenders of this small fort would have to rely upon a device, which, in character, is midway between the open *talaos* and the rock cistern to be presently noticed.

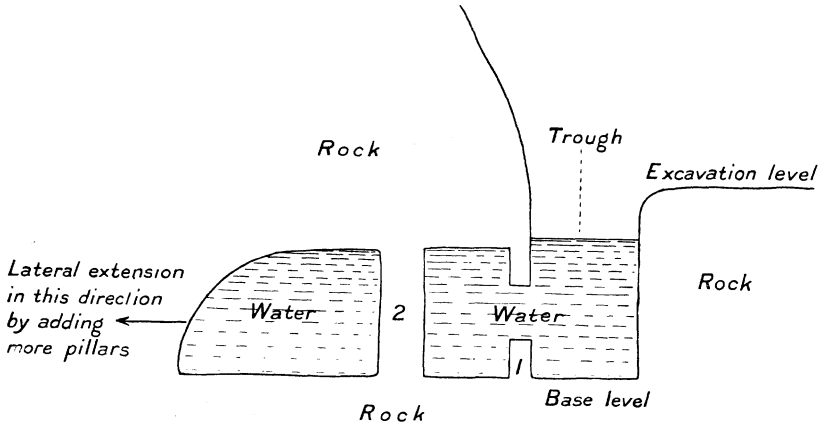
TROUGH OF ROCK CISTERN ON LALING FORT.



NORTH-EAST ANGLE OF GULNA FORT.

Even in a year of abnormally low rainfall this tank held water; there was a tradition in the village that it was bottomless, which at least went to show that it was regarded with some veneration.

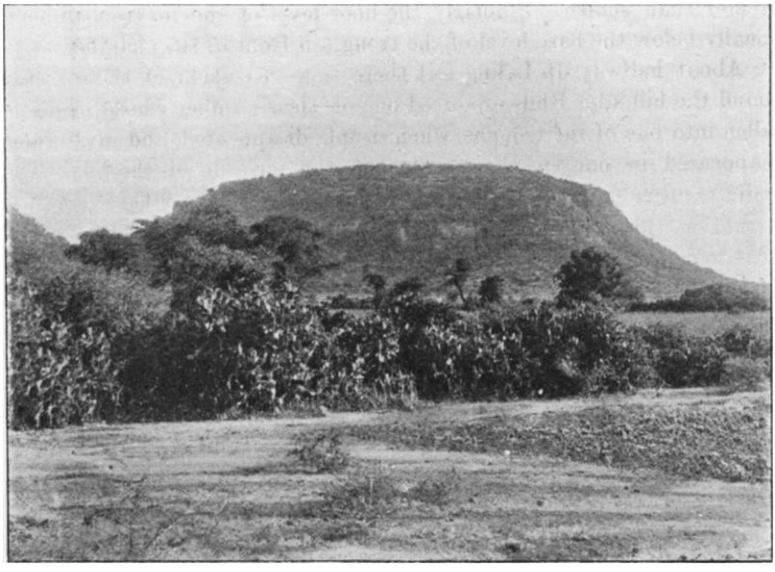
For those forts, however, which have no considerable plateau at the summit, or have defensive works lower down the hill, cisterns of remarkable construction were evolved. These cisterns are hewed out of the solid trap rock, and though they differ considerably both in size and construction, the principle underlying them all is the same. The problem was to conserve, as far as possible, all the rain which fell on the hill, and when the area of the hill was very limited, to collect and store the rain in open tanks, would have been to invite failure, for not only would there have been the chance of the water putrefying, but there existed the far greater danger of the limited supply disappearing altogether.



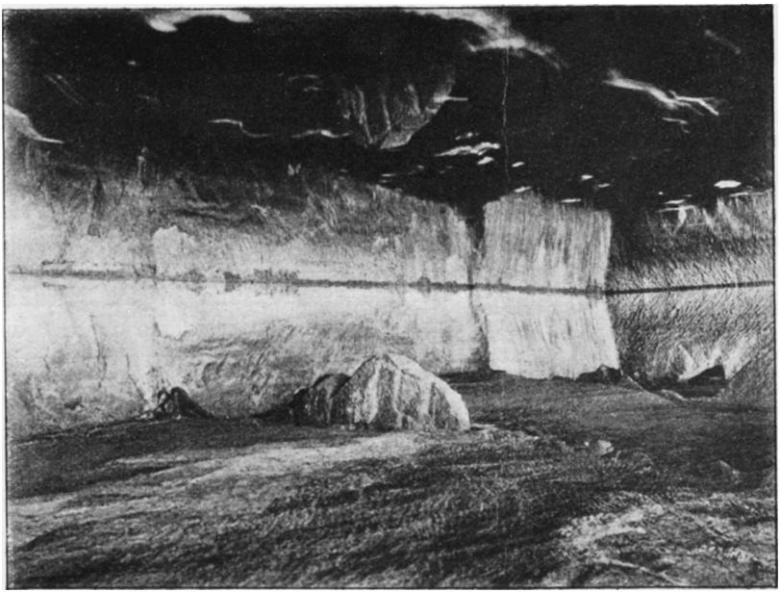
1. Rock ledge
2. „ pillar

PLAN B.

The evaporation for seven or eight months of the year is excessive, the relative humidity rarely rising above 40°, and frequently sinking to zero, consequently their small stock of water would rapidly disappear. From their practical experience of the effects of evaporation they evolved a rock-cistern, which could hardly be improved upon for the purpose for which it was intended. These rock cisterns, or *takis*, are cut out of the hillside in the solid rock. From the marks left on the sides of them, it would appear that they were cut with small chisels. There are several characteristic *takis* on Laling fort. The exterior view of one shows the trough and the entrance. The only evaporation which goes on is in this trough, the large body of water in the interior being completely free from contact with the outer air. Of the plans one (A) shows the front of the cistern with the excavation level removed, the other (B) shows the side view, the lateral extension with the hillside being usually considerably



GALNA HILL.



INTERIOR OF ROCK CISTERN, GALNA FORT.

greater than shown. Similarly the floor level of the inner chambers is usually below the base level of the trough in front of the chambers.

About halfway up Laling fort there is a succession of these cisterns round the hill, and Bhils produced one of their number whose uncle had fallen into one of the troughs, when drunk, disappeared, and mysteriously reappeared in one of the cisterns on the far side of the hill. These cisterns often communicate with an adjoining one, and the uncle when questioned admitted, rather shamefacedly, that he had only dived into the next trough, through an opening which he discovered on siphoning out the water. We undertook this experiment to test if there was any sign of spring action, as these cisterns were situated halfway up the hill. After emptying out many thousands of gallons we reduced the water to such a level that we were able to get into the trough and examine the inner chamber; we left marks and examined the level from time to time, but beyond very slow evaporation (the water having been siphoned out much below the base level of the trough) there was no alteration in the level to speak of. Certainly there was not a vestige of spring action. On examining the hillside we found an old drain leading to the cistern, and by the end of the next monsoon it was as full again as before. This experiment was admittedly not conclusive, but from the conditions prevailing on these trap-rock hills, I should be inclined to hold that there is a total absence of spring action in these cisterns.

Some of them, where fissures have appeared in the rock, do not hold water, but they differ considerably in construction from rock chambers which have been excavated in the hillside for storing food or war material.

A very large cistern with a pool in front, instead of a trough, is seen at Davlatabad fort.

A good illustration of the inner chamber of one of the cisterns with the pillars corroded is taken from Galna fort. Above the second line of defence there is a long row of these cisterns and chambers cut in the hillside. In these cisterns, which after the lapse of so many years since their construction hold water well, the water appears to be remarkably clean and pure, and I am told that water in large quantities is able to purify itself.

We found fish and crabs in several of the cisterns; the age of the water in some of the disused cisterns must be considerable. It has been suggested to me that the cisterns to be found on these hill forts are the work of Buddhists, and that they were appropriated by their successors, but the question is really an historical one, and all that one can safely say is that they were constructed when blasting was unknown, and must either have taken years to excavate, or have been excavated by abundant forced labour in view of military contingencies; local tradition does not help one in the matter, and these cisterns are not peculiar to hill forts, but are found on lines of communication in the hills, where water is scarce.

The
Geographical Journal.

No. 3. SEPTEMBER, 1912. Vol. XL.

THE MOUNTAINS OF NORTHERN SIKKIM AND GARHWAL.*

By Dr. A. M. KELLAS.

Along the northern border of India stretches the most stupendous mountain barrier in the world. The main axis of the series of parallel ranges and mountain masses known collectively as the Himalaya extends for about 1500 miles from east to west, and only comparatively small sections have so far been explored. The present communication deals chiefly with the northern portion of Sikkim, and is essentially a continuation of the exploration carried out by Mr. Freshfield, and reported to this Society. The mountains of Garhwal were also visited.

I have made three journeys to Sikkim in the years 1907, 1909, and 1911. In 1907 Swiss guides were taken, but they proved unsatisfactory, and in 1909 and 1911 only natives were employed. These natives were either Nepalese, Lepchas, or Bhutias. The Sherpas, who come from Eastern Nepal, were found to be the best, and they can be safely recommended to travellers.

My main object was to explore the glaciers of Kangchenjunga, and to ascend any mountains of the region which might prove accessible. Scientific work in connection with variations in the composition of the atmosphere at high altitudes, and alterations in the relative numbers of the red and white corpuscles in blood was attempted. It was intended also to make observations with regard to the so-called mountain sickness.

About the middle of April of last year (1911) I left Darjeeling with forty-four coolies, and in eight days reached the village of Lachen, situated at an elevation of 10,000 feet, in the upper Tista valley, about 110 miles north of Darjeeling by road. The scenery of the foothills passed through on the way has been so thoroughly and interestingly described by the late

* Royal Geographical Society, April 1, 1912. Map, p. 352.

Sir Joseph Hooker and Mr. Freshfield that we may start our journey at Lachen.

Having sent on a considerable quantity of stores to Thango, about 12 miles to the north on the Tibetan road, we left Lachen on April 24 with thirty-one coolies, eight of whom were Sherpa Nepalese, who were to remain with us permanently, the remaining twenty-three being Lachen men, who were to return after four days' march to the north west.

At Zemu Samdong (Zemu Bridge), about 2 miles north of Lachen, one leaves the pony track leading to Thango and Tibet, and proceeds through forest along the side of the Zemu river, which is followed to its source about 15 miles off in the glacier of the same name. This glacier drains the east face of Kangchenjunga. Between Lachen and the end of the Zemu glacier is generally considered a three days' march on the upward journey, as the route is very rough.

Many different types of animals are met with in these upper valleys. A few miles beyond Zemu Samdong the Lachen men lassoed a mountain fox. They wished to sell me the animal, declaring that its skin would fetch a considerable sum in Calcutta, but released it on my refusal. I was glad that they did not kill the creature for its long fur, which was a beautiful brown and black. It would be better if only dangerous predaceous creatures like bears and wolves, or game which is plentiful like hares, were killed in these upper valleys for some time. The Government is fortunately restricting the number of each of the different species of animals which may be shot on one gun licence.

On the fifth day from Lachen we reached the Green lake, situated at 15,300 feet, about 12 miles up the Zemu glacier. Here we found most of the ground deep in snow, and the Green lake itself only half its summer size, the eastern portion being a muddy flat. In summer the length is about a quarter of a mile.

From this point of view the tremendous mass of Kangchenjunga, which forms a most imposing series of precipitous ridges, effectually blocks the Zemu on the west. The chief peak (28,150 feet) is 8 miles south-west of the Green lake. The Himalaya here consists of three parallel chains running east and west, cut at right angles by the main Kangchenjunga ridge, which runs north and south. The Zemu glacier lies between the southern and central ranges.

Before exploring the glaciers on the flanks of Kangchenjunga, our intention was to force a pass suitable for laden coolies across the central range to Lhonak, the name given to the district between the central and northern ranges. The central range rises to a little over 20,000 feet near the Green lake. We made five attempts, but only managed to force two passes, one of which was suitable for coolies. We began with two frontal attacks. The first attempt was made on a ridge leading up to a small snow-peak north-east of the camp, but after ascending to 18,000 feet, we found it to be unsuitable for coolies, but practicable for a roped party.

We next tried further to the west, close to Green Lake mountain, but a heavily crevassed glacier was met with, only passable with difficulty by laden coolies. Here I was partially incapacitated for some days through slipping on glazed rocks. The accident was due to an experiment with boots two sizes too large with two pairs of socks, admirable for wading in deep snow in the early morning, but quite unsuitable for rocks.

The camp was then moved round to a small plain adjacent to the Tent Peak glacier, the main northern affluent of the Zemu glacier (marked as Green Lake glacier on Prof. Garwood's map). On the following day the main icefall of this glacier was climbed. This icefall looks much more formidable than it really is, but at the same time requires care. One found the coolies inclined to sit and smoke the inevitable cigarettes right under most dangerous seracs from which tons of ice might have fallen at any moment. After pointing out the dangers a few times they became quite cautious. Two coolies named Sona and Tuny were found to be good at ice-work, especially the latter, who is by far the best all-round coolie that I have ever met with. His ice-steps were admirable. At the top of the icefall, which is about 1000 feet high, we found that although the east Tent Peak glacier was a maze of crevasses, it would be possible to advance up its true left to the top of a pass just under a buttress of the Tent peak. Prof. Garwood's map here requires correction. It shows the east Tent Peak glacier as stretching up to the Pyramid, 3 miles further to the north-west, but this ground drains to Lhonak.

An easier route than that up the Tent Peak glacier seemed to lead north-eastwards up a tributary glacier, coming down from a plateau which obviously connected with Lhonak. The Nepal gap to the west seemed so easy that we could hardly credit that there must be a rise of 5000 feet from our camp to its summit.

Perhaps a few words might be said here with regard to the nomenclature employed in this paper. The system of naming the mountains is the same as that followed by Mr. Freshfield in his book 'Round Kangchenjunga,' namely, to give them descriptive designations, either from their form or position. Glaciers are named either from the chief peak feeding them, from the pass at their head, the place at which they debouch, or from the river flowing from them. In a case where several glaciers flow from one mountain, they are named after the peak with a prefix indicating direction of flow, unless a good special name is possible.

On the following morning at 6 a.m. we started for the Nepal gap instead of attempting the pass, because I was still a semi-invalid from the accident of three days before, and had on the previous day required considerable help from the rope in ascending the icefall. The Nepal gap (21,000 feet) is the first pass in the great ridge running northwards from the highest summit of Kangchenjunga. We had to cross the main Tent Peak glacier, and proceed up its western branch, which might be distinguished as the Nepal gap glacier. In about a couple of miles we came

to an awkward icefall, which took us nearly two hours to negotiate. It was far more difficult than when visited on two previous occasions (1907 and 1909), the arrangement of the seracs having entirely altered. We went right up through the centre of it, some gymnastics being required. Deep troughs containing ice-covered lakelets constituted one of the main difficulties. Above the icefall I had expected that we would proceed rapidly, but the crevasses were far more numerous than we expected, and up to 2 p.m. the glare of the sun was very trying, the heat being terrific, until quite suddenly, on reaching about 20,000 feet, we passed into an icy-cold wind, which was pouring through the gap from the west. The sun became obscured, mists swept up rapidly, and the coolies wished to turn back. As we had been as far in 1909, I had to refuse. Progress after that was slow. The wind coming through the gap became a gale, and was piercingly cold. The snow was frozen on the surface, but soft beneath, and we sank nearly to the knees. The coolies complained of incipient frost-bite, and we had to stop until they had rubbed their feet, and put dried grass, of which they carried a small supply, into their boots. About 3.15 we reached the base of the small rock wall at an elevation of 20,850 feet, which formed the summit of the pass (21,000 feet). This ridge was not difficult on the right, and although we were all extraordinarily tired (probably because we had done too much in the preceding week), I was strongly averse to turning back without climbing it, but Sona showed me that some of his toes looked white and numb, and to climb the wall might have taken at least half an hour in our exhausted condition. We therefore retreated as rapidly as possible, but, owing to our meeting with a second set of seracs below the icefall, we were delayed nearly three-quarters of an hour, and did not reach our camp until 6.30 p.m. I would strongly recommend any one attempting to cross the Nepal gap—and probably the other side, though steep, is not impossible—to camp above the main icefall of the Nepal gap glacier, so as to leave plenty of time for the upper portion. The map was found to be inaccurate with regard to the connection between the Sugarloaf and Twins groups. These are separate, and connected by a low, narrow col. It is also incorrect with regard to the mountain group to the west of the Nepal gap, which has no direct connection with the Twins group.

On the second day after attacking the Nepal gap, having moved the camp up about 500 feet, we proceeded to attempt the pass into Lhonak. The great icefall having been surmounted, we turned up the centre of the glacier on the east. After encountering very considerable difficulty with crevasses, we gained the dividing ridge. The view from the summit was interesting. Due north was the Chorten Nima La, practically free from snow on its south side. To the west lay the Langpo and Pyramid peaks. The pass has been named Lhonak La, and its elevation is about 19,500 feet. As it was only one o'clock, I wished to descend to Lhonak, and force our way back over the gap which lay at the head of the Tent Peak

glacier, it being at least 500 feet lower than our pass. The coolies, however, were strongly against the idea, and I thought it well to give in. Sona, who, as I learned by experience, was rather a pessimist, declared that the other side of Tent Peak pass was a sheer precipice, and that we would be benighted without food or shelter.

On investigation next day it was found that Tent Peak pass was an easy snow slope on the north side, and exclamations of "Achchha" (good) were heard in the camp throughout the evening. The coolies were delighted, because if we could not have managed the Tent Peak pass, they might have had to carry the baggage over the Tang-chung and Thé passes about 12 miles to the east. There are here two ridges between the Zemu glen and Lhonak, the central range forking a few miles east of the Green lake. As it would have taken between two and three weeks by that route, since there were more than three loads to each coolie, the saving of time and trouble was considerable. Four coolies were told off to move the baggage under Tandook's direction over Tent Peak pass, while the other three, including Sona and Tuny, came with me to attempt the Zemu gap and Simvu saddle.

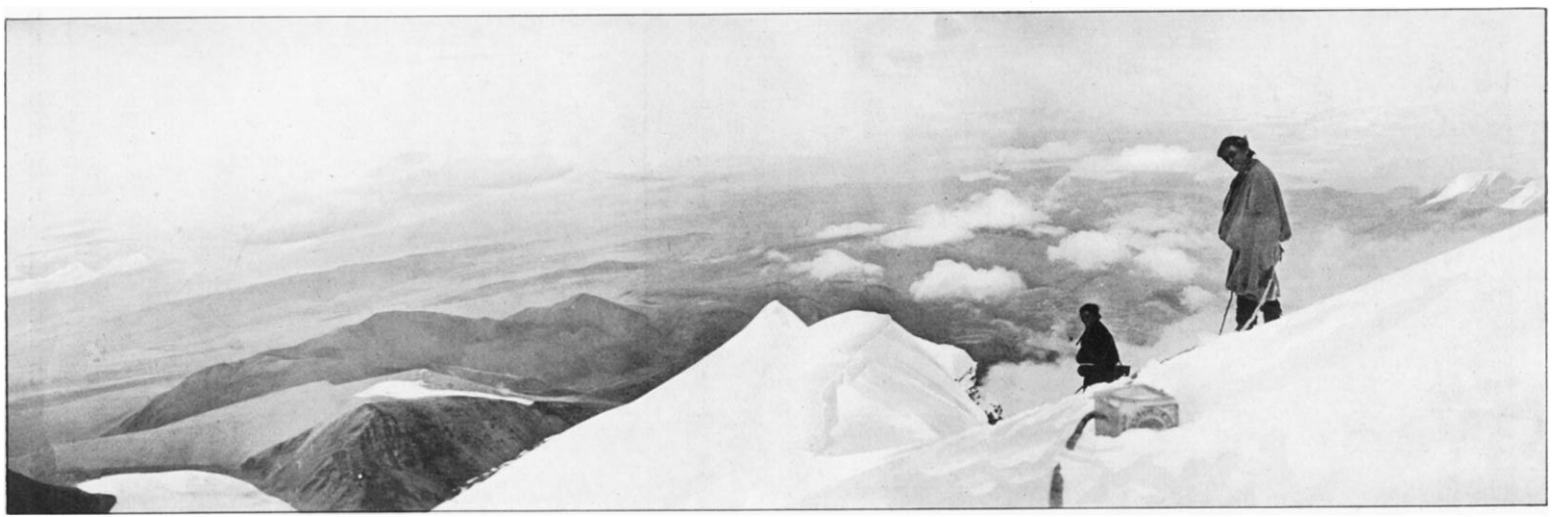
These are two possible passes over the southern range already mentioned. The Zemu gap, the more westerly of the two, lies between Kangchenjunga and Simvu (22,360 feet), and the Simvu saddle between the latter mountain and Siniolchum (22,200 feet). Our plan was to ascend to the Zemu gap, descend to near the Guicha La on the south flank of Kangchenjunga, force a pass to the Passanram glacier, and return to the Green lake over the Simvu saddle. This would make a most interesting circular tour, and is probably not impracticable.

Crossing the Zemu glacier, which looks like a chaotic muddle of moraine heaps rather than a glacier, we camped for the night on a sheltered bank partly covered with dwarf juniper, about 2 miles west of the North Simvu glacier. This was the only place of its kind for many miles, the last outpost of plant life in that wilderness of rock and snow. Next day we proceeded to an altitude of about 18,200 feet in the Zemu gap. Our route at first lay up the east side of the Zemu gap glacier. Towards three o'clock we found ourselves forced on to the side of Simvu by crevasses, and others barred further progress in front. A traverse to the right and short ascent showed us that all the crevasses had been turned, and that the remaining 1100 feet should present no difficulty. The night was bitterly cold, with wind and drifting snow. At 5 a.m. I roused the coolies, but the cold was so intense that they soon rushed back into their tent and cowered together. On my protesting, they declared it impossible to do anything in such cold, and that we would have to wait until the sun reached the tents. This would not occur until between 9 and 10 o'clock, as the sun would have to rise above a lofty buttress of Simvu. The manœuvre of retreating to their tent was repeated a second and third time, and I began to lose patience. It should be explained that they had

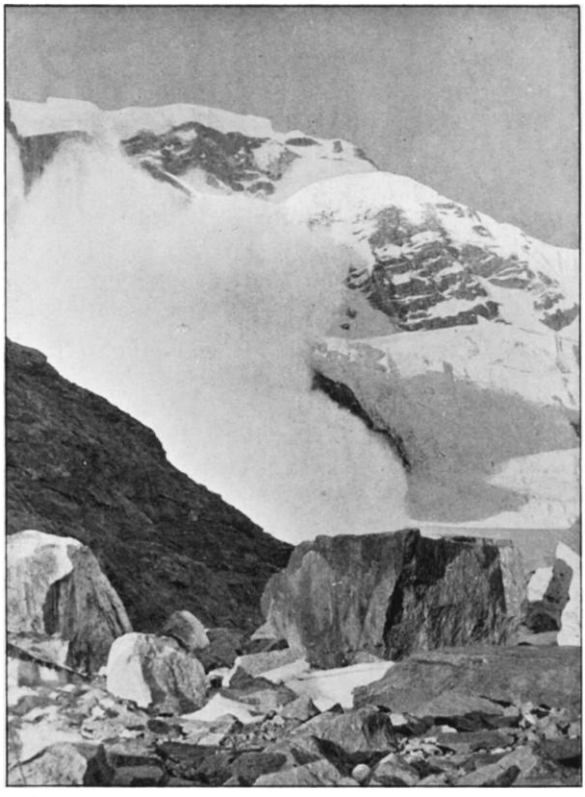
been given on the preceding night two large down quilts, so that they were as well protected as myself—I did not use a sleeping-bag—and they were wearing quite as much clothing. Eventually we got away about 8.30 a.m. just as banks of mist began to sail up the Zemu glacier. Going at full speed, and halting only once for a few minutes, we reached the top of the gap (19,300 feet) about 9.30 a.m., our pace being considerably over 1000 feet per hour. The going would have been very easy had it not been for 6 inches of snow which had fallen in the night, and in places blown into wreaths. Half an hour before we reached the top, however, grey mists were sweeping through it, and from the summit, which was only a few yards across, the view was spoilt. An icy wind blew through the gap, and it snowed intermittently. The slope fell away steeply in front, and a few yards down there was a crevasse which stretched right across the gulley.

After waiting for an hour in the usual freezing blast which comes through such gaps—only rewarded by a glimpse of a great white peak (presumably Pandim) through a rent in the clouds—as it seemed too hazardous to attempt a descent with heavily-laden coolies through mist, we retreated and proceeded to our old camping-place near the Simvu glacier. On the way the view of the crags of Kangchenjunga was very imposing, and we noted that the north-east buttress seemed almost inaccessible, and would, in fact, require difficult climbing to get properly on to it, as it degenerates into a narrow rock ridge which rises at the end into a small peak. On the following day we ascended to the summit of the Simvu saddle (17,700 feet). The climb was merely a walk along the west side of the Simvu glacier, and could have been made the whole way unroped. At the bottom of the glacier, about $1\frac{1}{2}$ hours from our previous camping-place, the coolies wanted to halt for the night, promising to start at 4 a.m. next morning. Referring to their behaviour on the previous day at the Zemu gap, I jokingly suggested that it was not 4 a.m. they meant, but 10 a.m., whereupon they laughed good naturedly, and we went on to the summit. This incident indicates one secret of how to deal successfully with coolies, who have a weakness for wanting to camp about an hour after starting in the morning. Mist was sweeping up from the south when we reached the top at 3 p.m. The descent was much steeper in that direction than to the north, and was blocked by an icefall about 250 yards down. We camped about 100 yards from the icefall. Towards evening the mists cleared except to the south, and there was a magnificent sunset over Simvu and the crest of Siniolchum. The west side of the latter mountain is very precipitous, but may not be quite impossible.

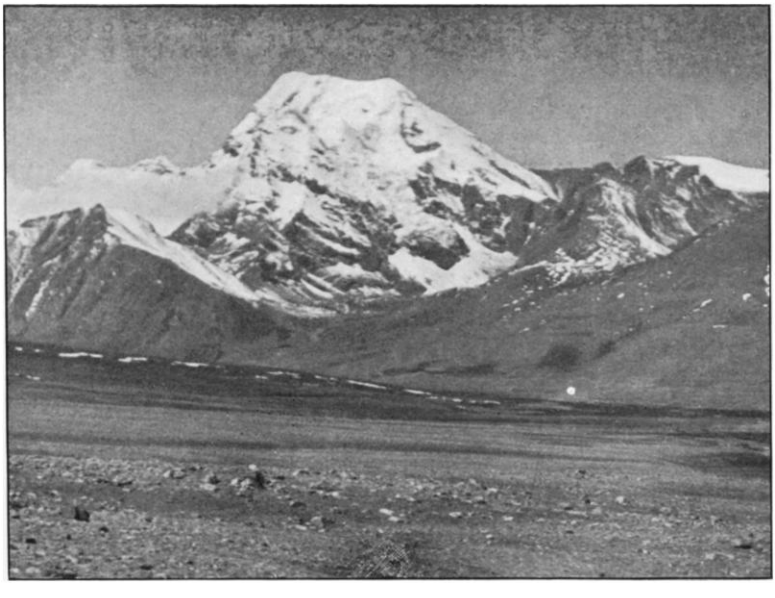
On the following morning we carefully surveyed the icefall, and came to the conclusion that it was practicable for a roped party of loaded coolies, but that great care would be required, especially on the descent. The pass leads to the Talung Chu, one of the westerly affluents of the Tista. It would be possible by means of this pass to reach Jongri, the



PANORAMA (140°) LOOKING INTO TIBET FROM THE SUMMIT ARÊTE OF CHUMIÜMO (22,430 FEET).



AN AVALANCHE FROM THE OUTLIER (22,500 FEET).



THE EASTERN FACE OF CHUMIUMO (22,430 FEET) FROM NEAR GIAGONG.

Kang La, and Phallut on the eastern border of Nepal, or, proceeding down the Talung Chu, Gangtok, the capital of Sikkim. Fine views were obtained from the summit both to the north and south, but the latter direction was quickly obscured by mist. We unfortunately had not enough provisions to descend the icefall, cross a ridge, and attack the Zemu gap from the south, as one would have liked. The weather, too, was stormy, and we therefore decided to cross the Tent Peak pass, and join our other party in Lhonak. The afternoon of the following day found us camped on the summit of Tent Peak pass. The route is quite easy. On the final ascent to the pass there are several large crevasses, so that coolies must be roped. We had intended to join Tandook that night, but the weather being bad we camped on the summit (19,000 feet), so as to get photographs on the following morning. Snow fell at intervals during the night and continued next morning. While we waited patiently for the mists to lift, three coolies of Tandook's section came up to remove some baggage we found on the pass. They informed us that Tandook was camped 2 miles to the north.

After waiting till the afternoon, as snow continued to fall under the influence of the southerly wind, while sunshine prevailed to the north, we descended the easy snow slope, crossed a glacier and the ridge beyond, and joined Tandook near a small lake. On the way we had to cross a glacier, and in trying to find a passage over a rapid icy stream on this glacier I slipped in up to the waist, owing to the bank giving way. Fortunately, I managed to scramble out unaided. Another couple of feet would have taken me into water at least 10 feet deep, running like a mill race. The incident is only worth mentioning because there were delays afterwards with other streams, so that an attack of mountain lassitude from which I suffered for the following two days may have been due to waiting about in wet and freezing clothes. The lassitude showed itself in a disinclination to strenuous exertion, and breathlessness in ascending the small hills round the camp, although the height was only about 17,700 feet. The gaps leading into Nepal were examined, as our original intention had been to cross the Langpo gap south of the Langpo peak and investigate the south side of the Jonsong peak. This gap, although practicable for a roped party, was not suitable for coolies. At least that was our conclusion at the time, but from later experience, as detailed below, I believe coolies could cross it with some difficulty.

On the afternoon of May 18 the camp was moved down beyond the end of the north-east Langpo glacier, which stretches further to the north-east than represented in Prof. Garwood's map, and on the following day, after crossing a ridge and passing a small lake, we camped in the afternoon by the Langpo Chu, just at the bottom of the descent from the Chorten Nima La. As the day was early, coolies were sent back to near Tent Peak pass to bring up the rest of our baggage, and with three coolies we ascended the great glacier bank on to the plateau which leads to the south ascent of the pass. This bank presumably formed the left boundary of a huge

glacier which in old times covered western Lhonak. Next day we crossed the pass (18,500 feet), getting a magnificent view from the summit. Our intention was to ascend the fine peak which guards the pass on the east, and which I have provisionally named "Sentinel peak."

About 7.30 a.m. on May 21, we started on the ascent. Our route lay chiefly up toilsome scree slopes for about 1500 feet, when we reached a crevassed snow slope. From the moment we reached snow we had to cut steps, although it was only *névé*. Very soon we were stopped by a wide crevasse, but on traversing horizontally for about 200 yards, we found a narrow bridge, and after that there was little difficulty. First we proceeded south towards what looked like the summit, but near this another higher summit appeared on the left. On reaching this, however, we found it to be merely the heavily corniced edge of a precipice which plunged down to a large glacier on the east, and a third summit appeared as a sharp snow-peak right in front. It was now about 1.30 p.m., and the coolies were discouraged. Tuny, who had cut steps the whole way, confessed to being exhausted, and Sona was pessimistic as usual, but after a rest they agreed to come up to the top. Unfortunately, a small portion of the *arête* was green ice, and necessitated careful step-cutting, so that it was past three before we reached the summit (about 22,000 feet), which has probably not been triangulated, but may be the peak named as 22,060 feet, and misplaced on map. The last portion was soft new snow, the slopes on each side being steep. It was misty and snowing when we reached the top, and after a halt of only a few minutes we began to descend, when the mist was blown aside and we got a fine view. It appeared that we had been at the end of a nearly horizontal narrow crest, but whether the other end was a few feet higher or lower I was unable to make out. It was obvious that glaciers occupied the defiles to both east and west instead of rivers as marked on the map. Mr. Freshfield has already pointed out how inadequately the Himalayan glaciers have been treated in the survey maps, and from what we saw here and in other places near the southern boundary of Tibet, the area under glaciers as represented in the latest map of Sikkim (1906), showing adjacent parts of Nepal and Tibet, should be nearly doubled.

After a rapid descent we arrived at our camp about 5.30 p.m. On the following morning we recrossed the Chorten Nima La and joined the main camp.

Next day found us on our way to the Jonsong La (20,300 feet, traversed by Mr. Freshfield's party in 1899), which was crossed on the following day, and our camp pitched at about 19,000 feet near the south Langpo glacier. From this position we had in 1909 ascended the Langpo gap and also the Langpo peak. Our present intention was to repeat the ascent of the Langpo peak, which was particularly easy in 1909, and from the top decide on a route up the Jonsong peak (24,400 feet), and more especially to investigate the summit *arête* of that mountain.

In August, 1909, the ascent of the Langpo peak was similar as regards difficulty to that of the Zermatt Breithorn from the Leichenbratter hut, with the exception that the last 600 feet was steeper than anything on the Breithorn. From the denuded appearance of the mountain, as seen from the Jonsong La—there is more snow below and less snow above 19,000 feet in May as compared with August—we were afraid that the final 1000 feet might be icy and difficult. This proved to be the case. The mountain at this early season of the year was considerably more difficult than the Finsteraarhorn *viâ* the Hugi Sattel, and we failed to reach the top.

During and after our attack on the Langpo peak the weather continued bad for several days, mist enveloping our camp a great portion of the time. Our next step was to descend the south Jonsong glacier, and turn north-west up a glacier provisionally named Long Ridge glacier from the mountain on the west. A pass at the north end of this mountain looked easy, but, on investigation on the following day, was found to be of the writing-desk type—an easy slope to the east and a fairly sharp precipice to the west. When we were on the summit of the pass the coolies pronounced the descent impossible, but on the following morning, after a little persuasion, three coolies agreed to come with me and attempt it.

Our intention was to cross Long Ridge pass (19,520 feet) and proceed west until we could find a way over the Chabuk La or some other pass to the north-west, and then return into Lhonak by the Chorten Nima La. We would by so doing get a proper estimate of the Jonsong massif, and ascertain whether any attack on the Jonsong peak was possible from the south-west. Our main object, however, was to find out the relationship of the lofty range which we felt convinced prevented the Mount Everest, Chomokankar, or Chomo Langmo group from being clearly seen from this portion of the range.

The ascent of the pass was not difficult, although there were several awkward crevasses. The descent was, however, very steep, probably at least an angle of 60° to 70°, and was made unroped, the coolies greatly preferring that arrangement; the rope would have been cut to pieces on the sharp rocks, so that I was quite agreeable. A stone tossed from the summit would have fallen on snow 500 feet below. A few small gullies filled with glassy ice were troublesome, requiring careful step cutting. After descending we crossed a glacier and camped on rocks about a mile to the west, under the precipices of a sharp isolated peak of the Jonsong group which we have provisionally named "the Outlier." It is probably about 22,500 feet high. From our camp we had a magnificent view of the north-west face of the redoubtable Jannu (25,310 feet), which looked like a great cathedral with twin towers.

Next morning we proceeded along the glacier, which ended abruptly in the most peculiar way at a corniced edge to a precipitous descent leading down to a glacier about 1500 feet below us. It was a regular "cut-off," and a discussion and delay followed. We had not expected anything of

the kind. The route seemed impassable for laden coolies in front, and the head of the glacier below us was barred by cliffs. Beyond the great trench in front was an array of peaks and passes. The coolies asked me point blank which was the Chabuk La, and I had to confess that I did not know. We had only two days' provisions, and were probably at least four days from the Chorten Nima La by that route. The map was hopelessly wrong, showing the unknown marvel of a river flowing in at the head of a glacier as being in front of us. The person who mapped this portion of the range seems to have been mentally related to the "scientist" mentioned in Mr. Freshfield's 'Caucasus,' who undertook to prove that there were no glaciers at all in the Himalaya.* To advance further with heavily laden coolies seemed unfair to them, but I regret now that we did not seek another route of descent and make the attempt. We could have hidden some of our baggage and sent back for it if necessary, but the idea did not occur to me until it was too late. As usual the weather gave the casting vote, so to speak. The clouds which had been massing round Jannu all the morning blew up with astonishing rapidity, and it began to snow. Reluctantly the order to retreat was given, and we returned to our old camp. In the afternoon a fine avalanche fell from "the Outlier," which I was fortunately able to photograph. The clouds of snow dust look like mist.

On the following morning we recrossed Long Ridge pass and reached our old camp by the Langpo glacier, and next day, crossing the Jonsong La, we reached Tandook's camp, at the foot of the slope leading to the Chorten Nima La. Taking two fresh coolies, two days afterwards we were at Thango, having crossed the Lungnak La (17,300 feet).

It must be pointed out that what we saw from Long Ridge pass conclusively proves that the Pandit Chandra Das must have crossed the Jonsong La, although he describes it under the name of the Chatang La. Prof. Garwood's adverse criticism of the Pandit's description of the route is probably due to his having passed over the ground in the reverse direction under different conditions. The pandit's description of his route from Ramthang northwards is correct, except as regards compass directions. The portion of the path mentioned as being among boulders is about 2 miles north of Pangperma, and the seracs referred to are those at the confluence of the south Langpo and Jonsong glaciers.

At Thango the party divided. Coolies were sent to Darjeeling and into Tibet for supplies, and four coolies with two yaks to carry wood came with me to attempt Pawhunri, a mountain on the north-east frontier of Sikkim.

Proceeding to Giagong and the Tso Lhamo (Lake of the Goddess), we reached the snow-level at 18,000 feet on the third day. Here one of the

* Presumably this portion of the chain was sketched from the indications of one of the native Pandits, whose drawing has been shown me by Mr. Freshfield.

yaks—aided and abetted by its owner—refused, like a sensible animal, to come further, so that we had perforce to camp early. On the following day an ascent to 20,700 feet was made, but we were driven back by a high wind which whirled the fine surface snow into dense clouds. The camp was next moved up to 20,000 feet, and on the following day we reached the summit, 23,180 feet. The view was unfortunately spoiled by clouds beneath us, but was nevertheless interesting. West and south nearly everything was obscured by a rolling sea of mist, above which some of the great peaks, Kangchenjunga, Chumiumo, and the Kangchenjhau, showed their crests like rocky islands. About 4 miles to the east was an accessible snow peak, about 23,000 feet high, and between us and it there flowed northwards a fine glacier, and not a river as marked on the map. On the way up we had glimpses of the north end of the Chomolari range, but the most interesting view of all was two lofty snow peaks bearing east-north-east about 100 miles off, which towered up above the horizon in a most imposing manner. Only snow was visible and must have represented about 6000 feet, which would make the mountains at least about 25,000 feet high. They seemed to be distinctly north of the main chain. Mist covered them before we reached the top. We took nearly six hours to ascend, but did not hurry. Keeping close to the edge of the western cliffs until about 1000 feet from the top, we then made a bee line for the summit through snow nearly a foot deep.

The summit was corniced to the east, and was some distance from and much higher than the tops of the western cliffs. We remained on the top about 35 minutes. We felt quite comfortable except for the cold wind, and I am confident that there would have been no difficulty in carrying out moderately complicated experiments, such as estimating the number of the red and white corpuscles in the blood. This is specifically mentioned because authorities have stated that such estimations would probably be impossible above 17,000 feet. Samples of air were taken, and estimations of carbon dioxide started.

Had we brought a spade with us, we might have dug a big hole on the top and brought up a tent next day to carry out some experiments, and get photographs. It was quite hopeless to think of pitching a tent unless we had some protection from the wind. The descent took us about two hours and a half, but we did not descend nearly so quickly as in 1909, when we only took about two hours between 23,000 feet and a camp at 18,500 feet.

During the ascent I carefully compared the climbing capacity of the two coolies with me—Sona and Tuny's brother—with my own, and found that they climbed much better, especially above 22,500 feet. Above that elevation they could have given me at least 300 feet in 1000 feet; that is to say, they were at least 30 per cent. better although they were lightly loaded. In 1909 (when 23,000 feet was reached) the two coolies with me seemed only slightly better than myself, but they were weaker than Sona or Tuny's brother.

This comparison of the white man with the native has some interest, and perhaps one might take this opportunity of succinctly stating the results of our experience in three visits to these mountains.

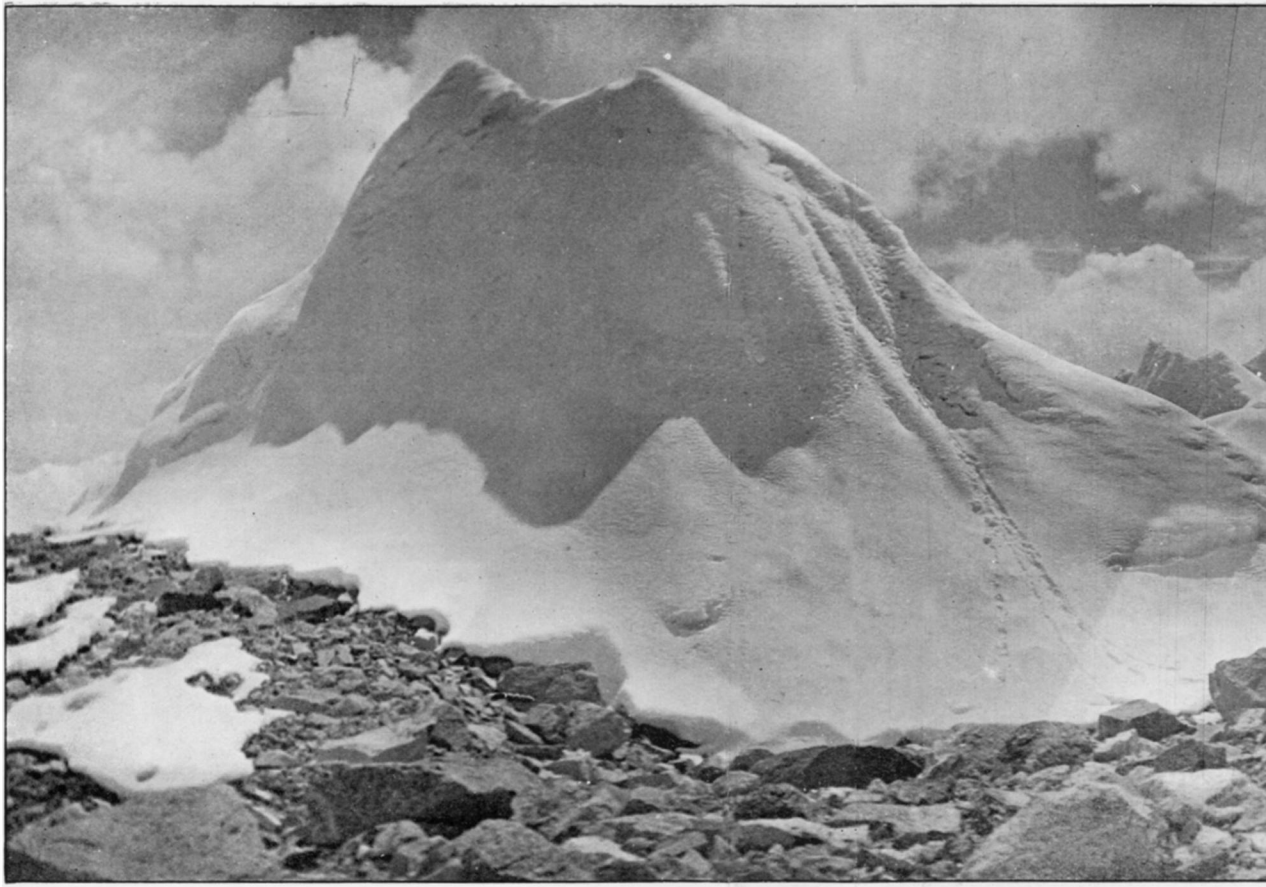
At any height up to 15,000 to 17,000 feet one could hold one's own with the unloaded coolie and easily beat the loaded man. Above 17,000 feet, however, their superiority was marked, an unloaded coolie climbing much quicker than myself, and even a moderately loaded coolie going up as fast as one cared to go, up to 21,000 to 22,000 feet. Above that elevation a moderately loaded coolie could run away from me, and with an unloaded coolie one had not the slightest chance.

Why should there be this distinct difference in acclimatization to high levels between white men and Indian mountaineers, and is the difference universal? I venture to think that Mr. Freshfield, Prof. Collie, Dr. Longstaff, and Mr. Mumm would agree with me so far as their experience goes. The Brocherels might, however, be taken as exceptions to the rule according to Dr. Longstaff's narrative of their behaviour on Gurla Mandhata and Trisul.

I have only had experience of two professional guides (Swiss) in the Himalaya, and they were more adversely affected by elevation than myself. It is not impossible that people accustomed from childhood to pressures of three-quarter atmosphere or less may either require less oxygen, or may have greater lung capacity. A little more will be said about this interesting subject—the effect of elevation—later.

It might be mentioned that at the camp, at 20,000 feet, estimations of blood-corpuscles (blood counts) were made without difficulty, but I confess that it required a considerable mental effort to bring oneself to carry out the experiments. One felt as if there was an extraordinary inertia to be overcome. There was also a peculiar tired feeling which increased in intensity with altitude. As we toiled up the last 1000 feet of Pawhunri, I recollect that it occurred to me that at last I probably understood in some measure the feelings of that mysterious class of people who are "born tired." I remember, too, that it afforded me some amusement to reason by analogy that as my tired feeling was due to altitude, and a descent of a few thousand feet would render me nearly normal, probably people who are born tired might possibly feel inclined to work at the bottom of a particularly deep mine, or in a caisson under high pressure. It occurred to me, also, that they should be examined medically to see whether they did not require instruction in respiration.

On descending to the desolate sandy flats at the base of the mountain, one is struck by the remarkable variety of wild life which may be met with. A herd of eight kiang passed quite close to us. Several types of wild birds were met with about the Tso Lhamo, including eagles, pheasants, and two pairs of handsome brown geese with black and white wings. Later on, we saw on the way to Chumiumo another half-dozen pairs of these geese, but we only saw one young one, of which the parent



PANORAMA (142°) OF THE NOR

PANORAMA (142°) OF THE NORTH-EAST JONSONG GLACIER (LHONAK GLACIER), SHOWING THE JONSONG PEAK (24,400).

Jonsong Peak.

G THE JONSONG PEAK (24,400).

birds seemed very careful. It made one annoyed to think that a certain type of gunner—one does not mean sportsman—could easily have exterminated all these geese, for they were quite easily accessible.

There was an extraordinary number of small birds, of which the commonest was a species of lark (*Melano-corypha maxima*), which must have been there in hundreds. We found four nests without looking for them, one with three young ones, two with two, and the fourth with two brownish eggs. The young ones differed in many respects from the older birds, which had a peculiar black collar. These larks began to sing before 4 a.m., apparently quite irrespective of sunrise, for there was no trace of the sun until at least an hour later. When one went near their nests their pleasant warbling was changed to a characteristic plaintive note, which no one could fail to recognize. Quite unwittingly we erected our tents about 3 yards from a nest. From the plaintive notes heard after we had settled down, I was sure that we must be trespassing, and, on looking, found the nest with two young ones. I was inclined to move the tents, as I was afraid they would starve, but in a short time one of the birds came to feed them, and continued to do so at intervals of a few minutes during the afternoon and next morning. Deer, hares, and little creatures like marmots were also seen.

We found the whole of this trans-Himalayan portion of Sikkim in the hands of Tibetans. There were four large black tents and many smaller ones, the number of Tibetans being about 50. The people were friendly, and men, women, and children were quite pleased to be photographed. These Tibetans were well off, and owned at least 2000 sheep and 150 to 200 yaks. It seemed somewhat an anomaly that while these people were given free entry into Sikkim, no white man was allowed to set foot in Tibet.

On the way back to Thango we met Mr. Bell, the British resident from Gangtok, who was most kind and hospitable. He was much interested in the report of the existence of lofty snow-peaks to the east-north-east, which he suggested were part of the Kuhla Kangri mountains. He had seen the south of Kuhla Kangri from Bhutan, but his account did not agree with the two peaks seen, which were probably about 12 miles apart and different in appearance. On asking Mr. Bell whether it would be possible to investigate the peaks from Bhutan, he stated that that country was quite closed to white men at present.

The weather continued so broken towards the end of June that we had to give up our intentions of attacking the Jonsong peak, and turn our attention to Kangchenjhau (22,700 feet) and Chumiumo (22,430 feet). On the way back from Pawhunri we had examined the north face of the former mountain as far as mist would permit, but could see no good way leading to the summit. The mountain had never been clear, however, even in the early morning. In order to investigate the south side we determined to ascend the Sebu La (17,600 feet), and started on June 22.

We had the pleasure of Mr. Bell's company for part of the way. The whole of Kangchenjhau was never visible at one time, but enough was seen to show that the mountain was practicable by a long icefall which started east of the main peak and curved round towards the south-west. It was impossible, however, to climb the mountain in the circumstances, because the relationships of the crevasses were complicated, and the possible route was only visible for a few minutes in the morning. It was therefore decided to cross the Sebu La and attempt Tsen Gui Kang, a fine peak 21,000 feet high which we had admired from Mome Samdong in 1909.

On June 23 we crossed the pass, and camped at about 17,000 feet, not far from a small ice-covered lakelet. On the ascent we met with large numbers of plants of the mountain rhubarb. The coolies seemed to appreciate them greatly, and gathered large quantities. I tried them, but found them somewhat insipid, and with none of the sourness of the cultivated plant. As, however, fresh vegetables had been very scarce, I asked Sona to cook some and serve with tapioca at dinner. In this form it was more palatable, but I am inclined to think contributed somewhat to insomnia and a peculiar intermittent throbbing in the cerebellar region, which occurred every few minutes for some hours.

It was about two o'clock when we reached the snow on the pass, and to my surprise the coolies were most unwilling to cross. They declared the snow far too soft, and I had to ascend alone nearly three-fourths of the entire distance to the summit before they started to follow. Having a rather hazy idea of the proper route, I went quite close to a few small crevasses which might easily cause trouble to an unroped party. I found later that these small crevasses are specially mentioned by Mr. Claude White in his book on 'Sikkim and Bhutan.' It snowed or rained nearly the whole of the day and two nights spent near Sebu lake, and as the crests of Tsen Gui Kang and Kangchenjhau remained obstinately in the mist we moved back to Thango. Here followed an awkward delay, because a portion of our party had not returned.

As our defaulters did not come in, and the weather continued bad, it was determined to make a serious attack on Chumiumo, the only mountain which might now and again be out of the mists. The coolies were somewhat discouraged on starting, as they declared that the Lachen men said that Chumiumo was impossible. They brightened up on being assured that there was no intention of clambering up the precipices which form the east and south sides of the mountain which they had already seen, and that the west side, when examined from a distance, seemed not at all difficult. Coolies have a very keen sense of the value of their lives, and dislike being taken into places even approximately dangerous.

Crossing the Lungnak La in heavy rain, we proceeded along by the Naku Chu, passing the ruins of an old Tibetan fort (Dzong) on the way. There were some fine herds of yaks in this valley. The evening of the

fourth day found us encamped on the south-west escarpment of Chumiumo under towering precipices. We found that Chumiumo was certainly possible from the south-west, but that the north-west *arête* looked much easier. Mist was almost continuous, and snow fell at intervals. This incessant moisture seemed to affect the rocks, and falls were more frequent than I have ever known them. Some tremendous rock avalanches fell from the precipices of the south face.

As our tents on the rocks were more exposed to the dangers of falling stones than is allowable for moderately orthodox climbers, and as the weather seemed much better a couple of miles to the north, we moved our camp round to the north-west face of the mountain. We camped near a beautiful clear stream of water flowing from a small glacier at 18,500 feet, and next day moved our camp up to 19,500 feet, camping on rocks which obviously contained a large quantity of copper. Although only about 2 miles in a direct line from our old camp at the end of the south-west *arête*, and in a similar position—namely, on rocks near precipices—the weather was quite different. Rockfalls were very rare, and the mist never came down to our level. As indicating the height to which the waves of the sea of animal life may reach, it is worth mentioning that a few delightful little rock warblers had built their nests at nearly 20,000 feet, on the rocks above our camp. They seemed quite fearless of man.

The south end of the mountain remained obstinately in mist, while the north end was fairly clear, and we looked over a large portion of Tibet. Tuny arrived from Thango on the evening before we made our attempt, along with Anderkyow, who had been sent for provisions. He reported that Tandook had returned with supplies.

On July 12 we started at 6.30 a.m. The morning was doubtful. Ascending to near the head of the glacier, we crossed, and went up to the right of some seracs which nearly touch the north-west rock *arête*. At a height of a little over 20,000 feet, near the base of the final ascent, were a few awkward crevasses, but after passing these the mountain was surprisingly easy. Tuny and Sona wished to try the north-west rock *arête*, but I insisted on trying the snow, which, although steep, was in excellent order, and probably took not more than a third of the time that the rocks would have taken. I mention this because the coolies always baulked from steep snow, being under the impression that it was dangerous. We arrived on the summit *arête* in mist, and had to wait for some time before the north top loomed up about 200 yards off. Ascending to this top, which is only a couple of yards broad, and appears as a sharp snow peak, we halted until the mist lifted somewhat, and then proceeded along the *arête* to the south summit, which is about 300 feet higher. It was a beautiful walk without the slightest difficulty, although in places the way was narrow and we were quite close to the edge of the formidable eastern precipices. The snow was never more than a foot deep. The south top is bounded on the south and east by precipices, but is several yards broad

and quite safe. We remained for about half an hour on the summit (22,430 feet), and then proceeded back by the way we had come. Mist had interfered greatly with our views from the top, but fortunately we managed to get some photographs, and we took others while proceeding along the *arête*. We were back in camp about four o'clock, after a day which impressed us all by its easiness. On the return journey the snow on the steep slopes was in good condition, but near the crevasses at the bottom was so soft that we sank repeatedly nearly to the waist. We frequently stuck, and had to extricate each other with ice-axes, the snow freezing suddenly just above the knee, so as to render movement of the leg impossible.

Sona and Tuny did not seem to be much affected by the elevation, while I felt that I could have climbed considerably higher. Whether this was due to a rest the day before, or to my becoming acclimatized to high altitudes, is somewhat difficult to decide. Probably both factors contributed, especially the latter. One of the main difficulties at high altitudes depends on the fact that one does not breathe rapidly enough to oxygenate one's blood sufficiently, and it is only after some weeks that one seems to be able to accustom oneself to breathing faster, which makes a great difference to one's comfort in climbing.

Next day we proceeded to Thango, a fairly long day's march. We crossed the north Chumiumo glacier, and, ascending the ridge to the east, descended to the pony track which proceeds north from Lachen to Kamba Dzong. From the summit of the ridge (about 20,000 feet), a superb view was obtained of the mountains stretching away to the west. What we had suspected before became clearly evident, namely, that on the east side of the Arun river there are several lofty peaks, which would almost certainly hide the Mount Everest group from any traveller on the mountains of North Sikkim, unless from view points over 21,000 feet high. The highest of the range, which is called Kanglingen, appears as a massive snow peak, and must be over 23,000 feet high. Near it a route leads from Saar over an easy pass called the Tok Tok La to the Arun river. We are, therefore, nearly sure that Mr. Claude White and others are in error when they state that they had good views of the Mount Everest group from positions on or near the mountains of North Sikkim. It is probable that on very clear days the loftier peaks may show over the Kanglingen group, but they could hardly be very conspicuous. Observers may have confused the two groups.

As we would have had to wait at Thango for at least a fortnight before the weather was good enough to guarantee a satisfactory view from the summit of the Jonsong peak, we decided to go round to the other side of Nepal and make an attempt upon Kamet (25,400 feet). This was not a judicious decision, as our time was too limited. Darjeeling was reached on July 25, and here we bade farewell to the faithful coolies who had accompanied us for about three months. In order to prevent misunderstanding, I must state that all of these men were in the best of health and

spirits. They were thoroughly satisfied with food and pay and the amount of work expected of them, and when asked at Thango whether they would remain for another month if we decided to attempt the Jonsong peak and the Kangchenjhau, every one of them volunteered to stay without hesitation. These Sherpa Nepalese coolies are, in fact, most agreeable to work with, and if treated kindly, will do anything reasonable.

Taking Tuny and Sona with us, we left Darjeeling on July 27, and three days afterwards arrived at the railway terminus of Katgodam, where our route joins that taken by Messrs. Mumm, Longstaff, and Bruce in 1905. Any one wishing to get a good idea of Kumaon and Garhwal cannot do better than read Mr. Mumm's book. On the third day from Katgodam we reached Almora, the capital of Kumaon. The deputy commissioner was absent, but the assistant deputy commissioner was most obliging and gave me a note to the Tashildhar, who threw himself into the business of getting coolies with a most praiseworthy energy. Within half an hour two sets of seven coolies each were paraded for inspection. I wished to select a few from each batch, but was informed that no one of the first batch shown would travel with any of the second because of caste prejudice. The men selected were quite different in physique from the Sherpa Nepalese coolies, being tall and slim, and their stamina was found to be inferior. They would only carry about two-thirds of the loads taken by the Sherpas, but they agreed to come through to Badrinath, about ten days' journey by the Kuari La. This was the first time that any arrangement of the kind had been entered into, and it worked well. The coolies required more encouragement than the Nepalese coolies, and being Hindoos, preferred to be paid cash for food. Any white man or Buddhist like Sona and Tuny touching their food would spoil it. I therefore left them entirely to themselves when at meals. The unconscionable time they took to breakfast—about three hours—during the first few days caused me to make inquiries. I found that they had only one small griddle pan between the seven of them, and that each of them used it for cooking ten to twelve chupatties in rotation.

The first three days' march from Almora to Gwaldam was very hot, and we were told the monsoon had failed, but at Gwaldam we entered what seemed to be a region of continual rain. For the next six days we pushed on through torrents of rain and dank and dripping forests to Joshimath We generally camped on the path and trenched our tents thoroughly. At Joshimath we met with a surprise and disappointment. The patwari, or local magistrate, called with a letter from Mr. Stowell, the Deputy Commissioner, prohibiting further advance, and threatening legal action if we proceeded. After telegraphing twice, and losing a day, we were allowed to advance to Badrinath.

After two days' holiday for the benefit of the Almora men, we proceeded northwards with fifteen coolies, and the second afternoon found us encamped at the end of the Khaiam valley. The coolies here quite misled

me, insisting that this valley afforded the best way to Kamet, whereas we should have taken the Khati (or Gastoli) valley to the south. We found these Mana men most unreliable as regards information, and would never again trust them. The geographical sense of many coolies is somewhat feebly developed. We pushed a camp up to 18,500 feet, and on the following morning were fortunate enough to get a magnificent view of Kamet and attendant peaks. Kamet looked impossible from the west, but it might be practicable to ascend a steep slope of snow to the south of the peak, and bend round on to the north-east face, which looks the most probable direction for a successful ascent. We climbed a small snow peak about 20,200 feet high to the north of the pass, but the mists had covered Kamet before we got to the top, and little further was learned. It was obvious that we had not time to attack Kamet seriously, so that Tuny and the Almora men were despatched homewards, while Sona and I, with three coolies, proceeded north towards the Mana pass leading into Tibet. On the morning of the third day Dhonerau peak, a long easy mountain about 19,000 feet high, was climbed.

From the summit we had a fine view of the north-west face of Kamet. This face looks practicable if one could get on to it. The arrangement of the gorges to the north-west of Kamet is probably incorrectly given on the map, and would repay investigation. If we had only had another fortnight! It was, however, imperative that we started for Bombay. Our Almora men were already three days' march ahead of us. A strenuous effort was therefore necessary, and we moved rapidly southwards by double marches, covering over 40 miles in the first two days.

Before concluding, perhaps a small contribution might be made here to the already voluminous literature on that debateable subject, the so-called mountain sickness. From our experience the alternative term "mountain lassitude," first introduced by Major Bruce and subsequently endorsed by Dr. Longstaff, is a much more satisfactory term. None of our party were in the slightest degree sick at high altitudes, and the climbing powers of the strongest coolies seemed to be only slightly affected even at 23,000 feet. Elevation in the case of a normal individual simply reduces their vitality and strength, and therefore capacity for resistance to the onset of sickness, which, when met with, is chiefly due to other more active factors. Elevation is essentially a predisposing factor rather than an active one, its effect probably depending upon diminished formation of oxyhæmoglobin during respiration.

The other factors, which, when aided by elevation, tend to upset one's capacity for keeping all the organs in the proper co-ordination which we call health, might be summarized as follows: 1. Inadequate training. 2. Indigestion due to unsuitable food. 3. Over-strenuous exertion. 4. Want of acclimatization to high altitudes. 5. Exhaustion. 6. Psychic effects. 7. High temperature. 8. Chill. 9. Snow glare. 10 Advancing age.

1. *Inadequate Training.*—This is serious in the Alps, but much more potent in the Himalaya.

2. *Indigestion due to Unsuitable Food.*—The best possible diets for high altitudes have yet to be devised. There is probably no doubt that the appetite is lessened. After long and careful experiment, we found that the best mainstay of both morning and evening meal was a large bowl of soup, thickened with rice and with added butter. The three ingredients were served separately. One could then add tongue, boneless sardines, etc., as wanted; but it was found that the entire elimination of meat by substitution of four or five freshly made chupatties (unleavened pancakes) with jam and butter was occasionally a good plan. Of course, different men require different diets, so that one must not be dogmatic.

We carried several tins of plasmon with us for use on an ascent of the Jonsong peak or Kamet, if opportunity offered, but unfortunately had no opportunity of testing them.

Perhaps peptonized foods and prepared substances containing glycerophosphates like sanatogen might be useful for protracted camps at heights over 23,000 feet. Hot tea in thermos flasks we found excellent at high altitudes, but the two flasks taken were broken within a month. Failing tea Prof Collie informs me that citrate of caffeine is an excellent substitute.

3. *Overstrain.*—Over-strenuous exertion is a frequent cause of real sickness, because the co-ordination of the different organs is rendered far more difficult to maintain. It is, therefore, probably better to go slowly, so that in this respect I would venture to disagree with Dr. Longstaff and to follow Mr. Mumm, who says, "Camp high and start late." I would prefer to read this, "Camp high and start as early as you safely can."

4. *Want of Acclimatization to High Altitudes.*—In attacking very lofty peaks it would probably be found advisable above 20,000 feet high to push camps up only from 1000 to 3000 feet per day, depending upon difficulties met with.*

5. *Exhaustion.*—When one is near the limit of one's powers, especially when fasting, the waste products thrown into the blood are beyond the possibility of natural elemination, and toxic effects are produced.

6. *Psychic Effects.*—These might be important, especially in the case of a beginner finding a place more dangerous than anticipated. Probably local blood congestion supervenes—perhaps splanchnic dilatation or constriction—which has a deleterious effect.

7. *High Temperature*, 8. *Chill*, and 9. *Snow Glare* vary greatly in their effects. They are indefinite factors which tend to upset the co-ordinating balance.

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* The idea that the bad effects of high altitude are cumulative is, we think, completely negatived by the ease with which, at the end of the expedition, we climbed Dhonerau peak (19,000 feet), marched about 20 miles, and then made 22 miles next day. In 1909 we also made about 40 miles in the first two days' marches when retreating from the mountains, after prolonged residence above 15,000 feet.

10. *Advancing age* is, like elevation itself, a general depressant of one's powers, but when I consider that one of the Vice-Presidents of the Society, when getting towards threescore, led a large party over a pass more than 20,000 feet high into an unknown country, the effect of age is obviously a variable one, and must be greatly discounted in certain cases.

It must not be supposed that the natives are never afflicted with what looks like mountain sickness. I have met with several cases, but usually at comparatively low levels, and in nearly every case the diet was to blame.

Perhaps three facts might be emphasized in conclusion.

1. The ordinary mountaineering rules regarding use of ropes, etc., should be carefully followed in the Himalaya, even in the case of snow passes used by natives, unless the position of crevasses is known. This is especially important before the summer snows begin, as numberless crevasses are then thinly covered. Exceptions are made in the case of moraine-covered ice streams like the Zemu and Kangchenjunga glaciers.

2. Men with cloth boots should not be taken on dangerous ice slopes, and especially ice traverses. This follows from what has been related above, and is confirmed by the experience of Prof. Collie in Kashmir.

3. Many of the Sherpa Nepalese are firstrate climbers as well as coolies, and could be used for serious climbing of the big peaks like Kangchenjunga, after proper training. Serious climbing in the Himalaya can hardly be said to have begun, but I might venture to express agreement with Mr. Freshfield's dictum, that all the great peaks can and will be climbed.

I must take this opportunity of thanking Mr. Claude White for kind help given in 1907 during my first visit to Sikkim, and also Mr. Bell, the present Resident at Gangtok.

Mr. DOUGLAS FRESHFIELD, Vice-President (before the paper): I must express the regret which I feel myself, and which you will all share, that our President is not able to be here to-night. We feel this regret the more on account of the nature of the paper before us—one on Himalayan exploration. Lord Curzon has always taken the deepest interest in Himalayan exploration, and when in office in India, he did all he could to further it, as far as the limited powers of a Viceroy extend. I quality the phrase because the energies of a Viceroy are liable to be hampered by political considerations, and by the scruples of native states. The paper we are going to hear to-night is on that part of the Himalaya which is comprised in the native state of Sikkim, lying some 400 miles almost directly north of Calcutta. It was first brought before the notice of the English public by Sir Joseph Hooker, in his charming work, 'Himalayan Journals,' published some sixty years ago. Twenty-five years ago a young Oxonian, Mr. Graham, described some remarkable climbs in this region. His story was largely discredited, partly through his own fault, for he was a very careless writer, but mainly because at that time many people could not conceive it possible that even trained mountaineers could climb at the pace he described—that is, at about 650 vertical feet an hour above 22,000 feet. It has interested me, in looking over Dr. Kellas's paper, to find that the height he was able to climb at that elevation was 600 vertical feet in the hour, while his native porters

NOTE.

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NORTHERN SIKKIM

To illustrate the paper by

Dr A. M. KELLAS

Scale 1: 300,000 or 1 inch = 4·7 Stat. Miles.

0 5 10 Stat. Mls

Route of Dr Kellas 1911.

88° 15′ 88° 30′ 88° 45′ 28° 27° 45′

T I B E T

Sepo La
Koru La
Na-go La 18186
Chumiumo 22430
Lhamo Tso
Kangchenjhau 22700
Donkhya La 16731
Pawhunri 23,180
22,965
Selu La 17,600
Mome Samdang
Tsen-gui-kang 21,000
Thango
Langnak La
Lachen R.
Nakw Chu
Chorten Nima La 18650
The Sentinel 21,100
20,290
Lhachenkang 21,800
22060
22,700
21240
Chabuk La
The Outlier
Jonsong Pk 24400
Longridge Pass
Jonsong La
Langpo Pk 22,800
Langpo Chu
Longridge Mt.
Jonsong Glacier
The Pyramid 23,400
Lhonak La
The La
Lhonak Chu
16,770
19,030
Thumrachen Chu
Thangchung La
Lachung R.
Chora La 17,900
Ramthang
Kangchenjunga
Pangperma
Tent Pk Pass
Tent Peak 24,100
23,470
Wedge Pk
Nepal Gap
Green Lake
Sugarloaf Pks
23,900
The Twins
Zemu Glacier
Zemu Chu
Zemu Samdang
Lachen
Lama Anden 19,250
Yumtso La 15,800
Kangbachen
25,300
21,500
Siniolchu 22,620
Simvu Saddle
KANGCHENJUNGA 28,150
27,800
Jannu 25,310
Zemu Gap 19300
Simvu 22,680
Kangchen R.
Passanram Gl.
Talung Glacier
Kabru 24,020
Guicha La
Pandim 22,010
Talung Chu
Tista R.

N E P A L — S I K K I M

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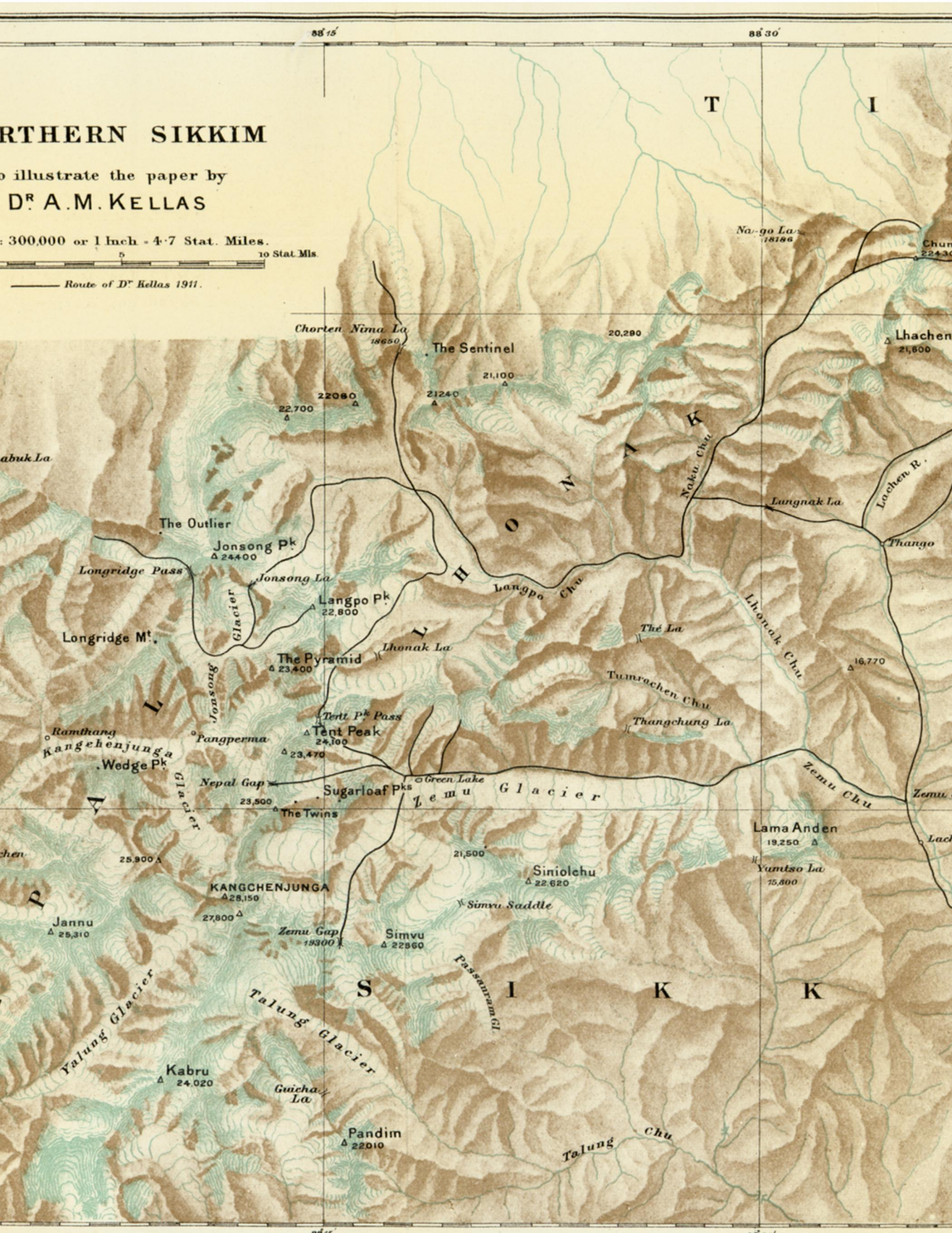
88°15'
88°30'
RTHERN SIKKIM
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10 Stat. Mls.
Route of Dr Kellas 1911.
T I
Na-go La 18186
Chun 22430
Chorten Nima La 18650
The Sentinel
21,100
20,290
Lhachen 21,600
22080
22,700
21240
abuk La
Nakw Chu
Lungnak La
Lachen R.
The Outlier
Jonsong Pk 24400
Thango
Longridge Pass
Jonsong La
Jonsong Glacier
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Zemu
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Lama Anden 19,250
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25,300
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Zemu Gap 19300
Simvu 22360
Passanram Gl.
Talung Glacier
Talung Glacier
Kabru 24,020
Guicha La
Pandim 22010
Talung Chu

88°45'
Sepo La
Koru La
T I B E T
Chumiumo
22430
Lhachenkang
21,600
Kangchenjhau
22700
Lhamo Tso
28°
Donkhya La
18,131
Pawhunri
23,180
Sebu La 17,600
22,960
Lachen R.
Lungnak La
Mome Samdong
Tsen-gui-kang
21,000
Thango
19,030
16,770
Lachung R.
Ghora La
17,000
Zemu Chu
Zemu Samdong
Lachen
K I M
Tista R.
T I B E T
88°
90°
28°
Punakha
NEPAL
SIKKIM
Gantok
BHUTAN
Darjiling
Kuch Behar
Brahmaputra
26°
ASSAM
Dinajpur
Bhagalpur
Ganges
B E N G A L
Murshidabad
24°
Dacca
Ganges
Bardwan
Chandarnagar
Howrah
CALCUTTA
Midnapur
22°
Belasor
Hugli
Mouths of the Ganges
Scale

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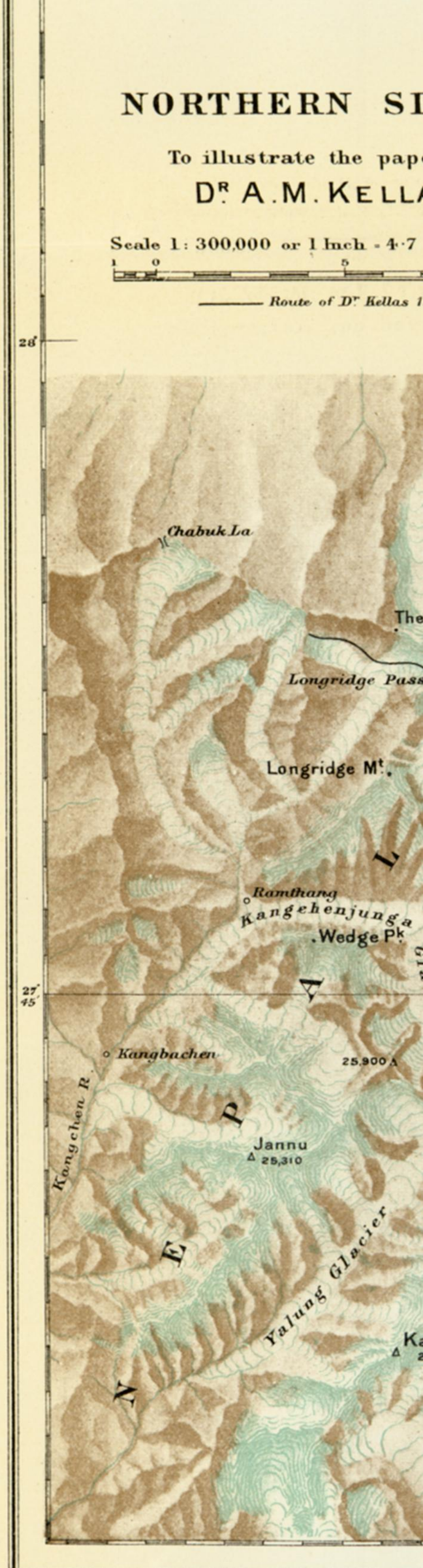

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NORTHERN SIKKIM

KELLAS

could do more. Then, some five years ago, two Norwegians, Mr. Rubenson and Mr. Monrad Aas, friends of Dr. Nansen, who had never done any mountaineering out of Norway, gained the summit ridge of Kabru, 24,000 feet, the mountain Mr. Graham had ascended, without meeting with any very formidable difficulties. Lastly, twelve years ago, I described here a tour of Kangchenjunga, which was made by my friends Signor V. Sella, Prof. Garwood, and myself in 1899. So far, I have spoken only of papers read before our Society. But there have been other explorers in these mountains. Mr. Claude White, who was for many years Resident at the Native Court of Sikkim, has wandered up and down along the Tibetan frontier. Anglo-Indian surveyors have triangulated the peaks. Native pandits have traversed the passes, and written very entertaining, if not always very intelligible, accounts of them. To-night we are going to listen to a paper by Dr. Kellas, a gentleman who has paid three visits to Sikkim, and made three mountaineering campaigns among its glaciers. He has managed to combine these with his duties as a Professor of Chemistry in this city. He will give us only a very brief summary of some of the results of the last of his visits. There is a great deal too much to be told in a single lecture. But I hope he will bring before us some interesting details with regard to the topography of these ranges, and also with regard to the relations of the great storehouses of snow which feed their glaciers. He may also be able to give us information with regard to the means that should be taken to counteract the effects of altitude on the human frame, and thereby to facilitate the conquest of the highest mountains of the world. If we listen carefully to what he tells us, we shall gather incidentally that he has been to the top of two mountains of over 22,000 feet and one of 23,180 feet. I say, if we listen carefully, because Dr. Kellas's modesty leads him to treat these matters quite parenthetically, and not to dwell upon them in the way in which you would expect an average traveller to do. I am afraid, also, you will hardly gather from his narrative a full idea of the difficulties and dangers of his Himalayan explorations. If he seems to move smoothly from height to height, you must recollect that he probably leaves out sundry dangers, and that by his skill and patience and experience he found the way to avoid others. The Eastern Himalaya are a range which requires considerable skill and mountain experience for its proper exploration, and I cannot recommend it as a field to the Alpine gymnast, who has little acquaintance with the varying conditions in different climates of the upper snows. With these few remarks, I will ask Dr. Kellas to read his paper.

Mr. Freshfield (after the paper): We have all enjoyed Dr. Kellas's very interesting account of a wonderful series of Himalayan experiences. I had hoped that my friend and former companion, Prof. Garwood, would have been here and been able to explain the circumstances under which his map was made. It was only described as a sketch-map, and he did not pretend to give any accurate account of all the recesses of the mountains. This was carefully explained in an accompanying note. He suffered under some exceptional difficulties—first, we had as guide a Pandit who, being very nervous himself of going into Nepal or Tibet, when he thought there was any chance of our getting into either, systematically led us astray; next, there was a premature and very heavy snowfall, which obliterated all the distinctions between glaciers and ordinary slopes. Despite, however, these difficulties, Prof. Garwood has, I believe, succeeded in providing a great advance on any previous map, and a very substantial basis which others may work to perfection. Dr. Kellas's paper, besides its interest as a description of one of the most fascinating portions of the Earth's surface, has a secondary importance. It may, I trust, prove a stepping-stone to higher things. It may be useful, as he has told us, in helping other climbers to deal with the loftier mountains which still remain unclimbed. The

poles have both been discovered, and we must confess that—at least, from the picturesque point of view—they are a disappointment. The North Pole is a speck on the shifting surface of a frozen sea; the South Pole a flat and featureless expanse of snow. Neither provides any natural sign to show the explorer he has arrived; he has to take up his instruments to prove that he is not far from the exact spot; he is unable to leave any permanent record of his visit. Now, it seems to me that the next problem to be attacked, the ascent of the highest mountains of the world, will be a more satisfactory one for those who attack it, because the adventurers who first shake hands on the top of one of the highest Himalayan peaks will have no doubt of their victory. The ascent of the highest mountains of the world is a task that will take money and time and perseverance and technical skill, but it will require less of these than has been required in the conquest of the poles, and it seems to me the reward will be as great, because, though these exploits may seem to belong not so much to science as to the adventure of travel, yet in the end science profits in one way or another. We have practically, in my lifetime, elevated the man-level from 18,000 or 19,000 feet up to nearly 25,000. How it is to be carried up higher Dr. Kellas has suggested to-night. The problem is one which may require time for its solution. But there is a general consent among climbers that it will be solved. Close attention to diet, frequent and light meals, prove the best means to prevent mountain lassitude from developing to an extent that incapacitates from climbing. An Arctic equipment, as light as it can be made, must be provided, both as to tents and clothing. A form of boots that will protect from frostbite, and yet not be dangerous in icesteps, must be evolved. The right season of year for each district must be ascertained; the local orography closely studied. Native coolies must be trained, as they were by Dr. Kellas, to glacier work. Bivouacs must be pushed higher and higher from the base until a light party can hope to climb from the last to the supreme summit. On all these matters Dr. de Filippi's sumptuous record of the Duke of the Abruzzi's recent expedition to the Karakoram supplies the most valuable information, and his conclusions agree, I think, in every respect with those independently formed by English mountaineers.

I am not going to follow Dr. Kellas by furnishing any further hints as to the best way to attack Kangchenjunga; for I am unwilling to do anything that may incite that enterprising body, the Press, to offer a large reward to some one to rush in and race a properly organized expedition. I make this remark not without foundation, for seven years ago a London newspaper sent out a person it described as its "special commissioner" to climb Kangchenjunga. The delegate took with him three Swiss, not Alpine guides, but, I understand, Swiss gentlemen. The party reached the base of the mountain; there one of the Swiss and four coolies perished in the snow! I trust whenever Kangchenjunga is attacked it will be by a properly constituted party; otherwise fresh disasters must be looked for.

Mr. Claude White: I have had very great pleasure in listening to Dr. Kellas's paper to-night, and, although I am no climber myself, I have been to the bottoms of most of the valleys from which Dr. Kellas made his ascents. There is one point that may be of interest, and that is, I found all my coolies and escorts got what I termed "mountain sickness" at a height of about 15,000 feet; I cannot tell you from what cause, but if I got them past that height, I could generally get them up to 19,000 or 20,000 feet. Dr. Kellas is scientific; he may be able to give you some explanation of this.

Mr. A. L. Mumm: I have listened with intense admiration to Dr. Kellas's story, and I have looked with amazement at his photographs, but I think the most amazing thing I have seen this evening is really this map with his route marked upon it.

That brings graphically before one the extraordinary amount of ground he covered in a single season at immense elevations, above ice and snow all the time, crossing passes 19,000 and 20,000 feet high, and ascending peaks of 22,000 and 23,000 feet, in a way which, I believe, has never been paralleled. The first and most obvious reason for his success was his extraordinary energy. He seemed to me to be above all human weaknesses, and I was quite relieved when towards the end of his paper he had to admit being subject to a small extent to mountain-sickness, in the reality of which I have a most profound belief. Next to his own personal energy, I think that the leading cause of his successful achievement was the great skill which he displayed in training and managing his coolies. The same skill in that respect was displayed by Mr. Rubenson, to whom Mr. Freshfield referred, a few years ago, but Dr. Kellas went one better than Mr. Rubenson, who had the support of a skilful European mountaineering companion, whereas Dr. Kellas had to rely solely on himself and the pupils of his own training.

I have no knowledge of Sikkim, and have nothing to add to what Dr. Kellas said about that region; as to Kamet, all I have seen of it was the eastern side, which was the exact opposite to the side he visited. I think two other parties besides Dr. Kellas have approached it since we were there, but none of them has made a really serious attack on it. The fact is, it is from all sides ungetatable. There is one further point with regard to the extraordinary amount of work done by Dr. Kellas. Most travellers who go to new, unexplored parts of the Earth's surface, go once and do not return, and I think all of them come back feeling how much better they could do things next time. They bring away a great deal of experience, which is unfortunately personal and largely incommunicable, and however much the next man may sit at their feet and hear all they have to say, it is impossible for him to start where the first man left off. Dr. Kellas has not said much this evening about his two earlier expeditions, and I gather that his achievements in the course of them were relatively slight compared with those of last year, but I venture to think he would not have achieved anything like the measure of success which he did in 1911 if it had not been for those two earlier trips. Everybody has to acquire his own experience for himself, and if any one light-heartedly imagines that he can follow Dr. Kellas and go out without any Himalayan training and accomplish anything like the same amount that he did, he will be very grievously disappointed.

Mr. FRESHFIELD: I think I may now terminate the proceedings by echoing, as I am sure all here will wish to echo, the sentiments that have been well expressed by Mr. Claude White and my friend Mr. Mumm with regard to Dr. Kellas's remarkable mountaineering tour—one of the most remarkable and probably one of the most fruitful that has ever been accomplished by a mountaineer in the Himalaya. We all congratulate him on the success which met him in his persistent explorations. We thank him for the excellent photographs he has shown us to-night, and we wish him many happy returns to the Himalaya. I am sure you will desire to carry by acclamation a vote of thanks to Dr. Kellas.

Dr. Helland-Hansen's chapter on "Physical Oceanography" is a splendid contribution to the science. It extends to 97 pages, and is an admirable exposition of the most recent instruments and methods as perfected by the Norwegian investigators. He also gives a summary of results as to the physical condition of the water in the North Atlantic, and dwells on the important relationship between the temperature of the surface water of the ocean and the climate of the countries bordering upon it; but he points out that much further research is necessary before oceanographers will be able to solve all the problems which the expeditions of the past and of the present have brought forward.

It is most heartily to be hoped that the sphere of the International Council will be widened to the whole Atlantic by the co-operation in the work of the United States and Canada on the other side of the Atlantic and of France on this, while the increased public interest in drifting ice caused by the *Titanic* disaster has turned the attention of the Board of Trade to the need for additional research in the region lying to the north of the steamer tracks. It is not often that the need for investigation in any department becomes acute just as the means for carrying out such investigations have been brought to a state approaching perfection, and we sincerely trust that advantage will be taken of the moment and the means to extend our knowledge of Atlantic oceanography in the confident expectation of immediate practical applications.

A VISIT TO LABRANG MONASTERY, SOUTH-WEST KAN-SU, NORTH-WEST CHINA.

By Major GEORGE PEREIRA, C.M.G., D.S.O.

I LEFT Lan-chou Fu on May 2, 1912, taking two Pekingnese boys, and horses, whilst my baggage followed on mules. It is three stages to Ho Chou across a hilly country, occupied by Chinese and Mohamedans, with three steep hills to cross. The hills are mostly terraced for cultivation. Ho Chou, 70¼ miles distant with a population of under 30,000 inhabitants, consists of a northern or Chinese city and a southern or Mohamedan city, and is the centre of the Mohamedans of the province of Kan-su. It lies in the fertile valley of the Ta-hsia river, called Ta Ho or Great river by the people. This valley is followed all the way up to Labrang, 78¼ miles distant. After the first 23 miles, the hills get higher and close in, and villages and cultivation become less; the only crop grown in the upper part of the valley is Ch'ing-k'ou, the huskless barley. Three or four of the bigger villages are occupied by Mohamedans or Chinese, but the population consists mostly of domesticated Tibetans (known as "Chia-fan" in the Hsi-ning district), who have a good deal of Chinese blood. It is a very noticeable fact that the Chinese who take Tibetan wives in these regions soon adopt Tibetan manners and customs, and their descendants are

more Tibetan than Chinese. This is not the case, however, with Mohamedans, who do not so often make Tibetan marriages. Domesticated Tibetans, living in villages, are found all along the borderland and separate the Chinese from the nomad Tibetans who live in black tents, and have large herds of sheep, ponies, yaks, etc., guarded by large dogs, the fiercer of which are kept chained when the nomads visit the Chinese borderland. Beyond Ch'iao-kou, the country is under Tibetan rule, though nominally dependent on the Chinese sub-prefect of Hsün-hua T'ing, further north. Though officially part of the province of Kan-su, it is really Tibet.

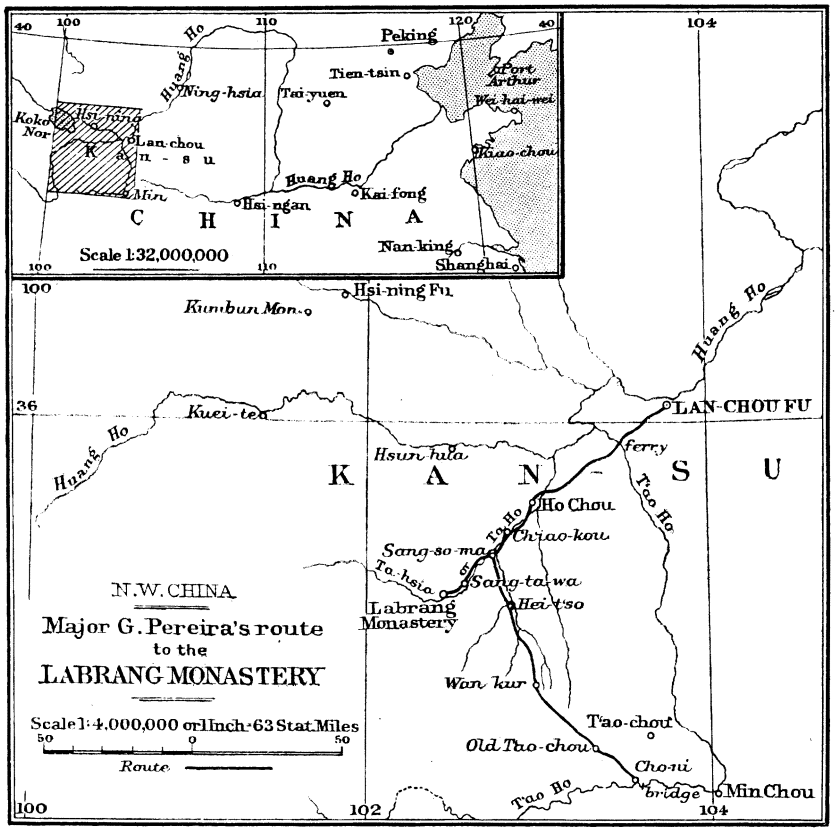
At Sang-so-ma, 55 miles from Ho Chou, there is a Tibetan monastery and a village with nine Mohamedan families and one Chinese. There is a good deal of Chinese or Mohamedan traffic between Ho Chou and Labrang, the latter, for instance, being dependent on Ho Chou for flour, and, in cases of trouble with the monastery, the Chinese can bring pressure to bear on them by closing down the flour supply. Rafts of logs, worked by two Chinese, are floated down the river from Labrang (when the water is high) to Ho Chou, and thence by the Yellow river to Lan-Chou.

Sang-ta-wa, a village of from three to four hundred Mohamedan and Chinese families, is the halting-place for Labrang Monastery, ¾ mile distant. At Labrang I took the precaution of sending in my card to the head Buddha, and finding one belonging to the provincial treasurer (fan-t'ai) of Kan-su, I sent it in with mine, the Chinese equivalent of a letter of introduction. I then received a message to say that two guides would be sent to show me round. These soon made their appearance, one a monk, the other a Yamen runner, both men of a villainous type of countenance. Escorted by these and a curious but inoffensive rabble of monks, Tibetans, Chinese, and Mohamedans, I then started on a walk round.

Of the great monasteries of Kan-su, Labrang is perhaps the most important. The head Buddha is elected by divination by the living Buddhas of the monastery, and the choice is sent to Lhasa for ratification by the Dalai-Lama, who may, however, alter the selection. Kumbun has more monks, but it is more directly under Chinese influence and has not therefore so much religious importance. The other important monasteries are Bya-kyung (pronounced Sha-Zung) and Rung-bo (pronounced Rung-o), 10 miles south of Pao-an or two stages north of Labrang, each with 1000 monks, Hei-t'so between La-brang and old T'ao-chou with from 800 to 1000 monks, and Cho-ni on the T'ao river (south-east of old T'ao-chou) with about 500 monks.

At Labrang there are altogether 3600 monks and boys. The head Buddha or Jong-yang-sheba (in Chinese Chia-mu-yang) was away at Lhasa. The present incarnation is about 65 or 66; under him there are 18 living Buddhas. Below them are 500 lamas or superior priests. Below them come "dge-long" or ordained priests, "dge-tsug" or acolytes, and "pandi" or neophytes.

For the management of affairs there is a treasurer (Hsiang-zot), directly under the head Buddha, assisted by two stewards. For discipline, there is a president (Jewa). He has powers of punishment. For grave offences a sheet of paper is put over the monk's face and he is branded on the forehead with a red-hot key and is then led to a small door and banished from the monastery. Another punishment is cutting off the ears or nose, but this is rarely, if ever, practised. Another punishment is to suspend a monk by the hands from a tree, either entirely or with his toes just



touching the ground, and he is kept suspended for different lengths of time up to two or three days. The commoner punishments are beatings, or else being fined. Even lamas are liable to be punished in these ways, though generally they are given the opportunity of getting away. Below the president there are five "dgo-dgos" (pronounced gay-gay) or "virtuous commanders," each in charge of a hall or section, devoted to a branch of Buddhist learning, such as doctrine, astrology, dancing, etc. During the services they walk about carrying sticks, with which they rouse nodding monks. All the monks at Labrang are Tibetans, and belong to the yellow

or reformed sect. All monks have their heads shaven, whilst the village Tibetans wear a small queue. Immorality appears to be very prevalent in the monasteries, and not rare even among the living buddhas.

Under the monastery there is a Tibetan Ya-man, or civil court, presided over by two officials of equal rank, called Onyerwa. They can inflict barbarous punishments, and it is a disgrace to Chinese officials that they allow Chinese and Mohamedans to be tried by this tribunal. Tibetan villages extend 6 or 7 miles west of the monastery. Beyond that there are only nomad Tibetans, known as Abrogba (pronounced Drok-wa) who live in tents. The Tibetans are a lawless race, possibly 90 per cent. are robbers; they are continually at war amongst themselves, and this enables the Chinese to exercise some sort of authority over them. Mohamedan and Chinese traders go amongst them only in large bands, and pacify the robber chiefs with presents. The Tibetans appear to spend their time between robbing and being robbed, whilst Chinese officials have their own ingenious methods of squeezing them, and Chinese merchants fleece them unmercifully when they visit the towns.

The monastery of Labrang lies in the valley of the Ta-hsia river, and a very good view of it is obtained from the hills to the south. It is much better situated than Kumbun, which is crowded up in a narrow circling valley. It consists of a large network of buildings, conspicuous among which are two gold-roofed buildings on the north side. Of these one is two or three storied with a bronze roof over which gold has been poured, and is the residence of the head Buddha. The other called the Kin-cov, is the chief temple and is single storied with a double roof on which gold has been poured over the bronze. The roofs of these buildings are of Chinese architecture. Standing up among the rest there are some thirty two-storied temples or houses, the residences of the living buddhas, mostly of stone painted red with layers of brown reeds laid crosswise above the stones and with ends cut off evenly, giving a quaint appearance to Tibetan buildings, unlike anything I have seen elsewhere. The windows are closed by shutters and formed by black beams, the side ones slanting inwards from bottom to top, giving them a sort of ancient Egyptian appearance. Golden plaques hang down on the front of the houses, whilst there are two gold stays over the doorway. One building in the south-east corner of the monastery has a fine green-tiled Chinese roof, but the rest have flat roofs ornamented along the fronts and at the corners by golden objects, which look like tea-urns, milk cans, and small pagodas. I only noticed two chortens, viz. a fine big gold one at the south-west corner, and a whitewashed one at the north-east end, around which a band of pilgrims circled like a stream of ants.

The monastery is completed by innumerable lower buildings, generally whitewashed, with courtyards, where the ordinary monks reside. These are separated by rows of narrow streets. There are in addition, as at Kumbun and elsewhere, special kitchens with huge circular Chinese bronze

ovens. These are used on feast days or when the monks are specially engaged by a private family to chant prayers, and the tea and rice for the whole of the section is prepared here, the cost for feast days being defrayed out of the monastic funds, whilst for private services it is paid for by the family in whose behalf the prayers are said.

On the east and south sides of Labrang are long, narrow porticoes filled with large prayer-wheels or rather revolving cylinders with Tibetan words in black, some painted bright red and other colours, or faded by constant use. The pilgrims as they pass down the porticoes, give the cylinders a push, and thereby store up a fund of countless prayers without any mental effort. Sometimes one sees a man, woman, or monk making a full-length prostration, bumping the head and describing a semicircle with the arms as far as they can reach. After which they rise and continue the practice. This appears to be the only form of Tibetan devotion requiring any special effort. At Kumbun, they assured me trained monks could do a thousand or more prostrations at a stretch. I did not visit any of the interiors of the temples, as they were all locked up, but, as is the case with all Chinese temples, there is nothing of interest inside. The porticoes were adorned with Chinese paintings, the most interesting of which are the Buddhist hells, where the Chinese artist revels in his element, and surprises the visitor by the novelty and ingenuity of tortures he invents, and by the expressions of placid enjoyment he depicts on the countenances of the presiding demons.

According to my aneroid, Labrang is 10,430 feet above sea-level, but this may be several hundred feet too high (?).

From Labrang I returned to Sang-so-ma, and taking one soldier as an interpreter I traversed a purely Tibetan country for three days to old T'ao-chou. At Hei-ts'o, the first stage (23½ miles), there is a monastery of some 800 Tibetan monks; near it there is a village with 75 Chinese and Mohamedan families. The village has two streets, the houses being flat-roofed, so that one can walk from one end to the other. As the inns were filthy with only one room for guests and stabling, I decided to occupy a small room on the roof. Here I was pestered by crowds of monks, Tibetans, Chinese and Mohamedans, who wished to see the foreign curiosity, and tore holes in the paper windows to get a good view. After repulsing them twice, I finally decided when I had finished my work to give them an uninterrupted view, and for two hours I sat outside or walked up and down till darkness brought me a relief.

Leaving Hei-ts'o I traversed a hilly country with a few Tibetan villages for the first 10 miles, and then for 15 miles among grassy downs occupied by nomad Tibetans (called Abrog-ba, but pronounced Drok-wa, meaning nomads) living in small black tents, guarded by fierce dogs, with herds of sheep, ponies and yaks. This part has a bad reputation for brigands, and my soldier had a scare, declaring some mounted robbers were waiting for us on a hill, but having got out and loaded my rifle, fowling-piece and

revolver, I failed to see them. That night I put up at a Tibetan inn at Wan-kur, where I shared the kitchen with my host and his family, and the next day I met with the kind hospitality of Mr. Simpson and his family, of the American Church and Missionary Society at old T'ao-chou, a small walled town of some 1500 families, chiefly Mohamedan. Fifteen and a quarter miles to the south-east is the town of Cho-ni with some 300 families, chiefly Tibetan or half breeds with Chinese, with a few Chinese. The Tibetans will not allow Mohamedans here. It is also the residence of the Tibetan prince of Cho-ni, Yang-ching-Ch'ina by name, a youth of twenty-three, who is, however, more Chinese than Tibetan in his manners and descent. He rules over forty-eight clans of Tibetans, and an area of country about one-third the size of Scotland. He receives tribute from his clans in various kinds, such as gold rope, grain, etc. Owing to his injustice he is not popular in his principality. At Cho-ni, I met with the greatest kindness and hospitality from Mr. Christie and his wife. Just above the town there is a large Tibetan monastery with five hundred monks, among whom there are five living Buddhas. I visited it with Mr. Christie and met with a most friendly reception. Curiously enough, in the Tibetan monasteries of these parts are signs of phallic worship. The monks nominally do not pay any attention to them, and the images are kept out of general sight, but they are more resorted to by the people even than the worship of Buddha, and at one of the temple doors I saw offerings of birds. From Cho-ni I started on a short hunting trip in the country to the south, where the Tibetan wild sheep are to be found on the mountains, besides serow, leopards, muskdeer, wapiti, roe, wild boar, bears, ear pheasants, etc., in the hills near Cho-ni.

PROGRESS IN THE SUDAN; THE INTERNATIONAL MAP.*

By Colonel Sir C. M. WATSON, K.C.M.G., C.B., M.A., R.E., President of the Section.

THE last occasion upon which the City of Dundee extended its hospitality to the members of the British Association was in 1867, forty-five years ago, and, at that meeting, the President of the Geographical Section was Sir Samuel Baker, who had then recently returned from his explorations on the upper Nile, for which he had been awarded the Patron's Medal of the Royal Geographical Society, and which were of the greatest importance as regards that then little-known river.

In the Address which he gave to Section E, Sir Samuel Baker naturally referred at considerable length to the geography of the Sudan, and to the question of the sources of the Nile, which had been discovered a few years previously by Captain Speke and Captain Grant, when they visited the great lake, named by them the Victoria Nyanza, out of which flows the main branch of the river, the fertilizer of Egypt, which, after a course of more than 3500 miles, pours its waters into the Mediterranean. He also spoke of the second great lake, the Albert Nyanza, which he had himself discovered, after a long and very

* Presidential Address to the Geographical Section of the British Association for the Advancement of Science, Dundee, September 5, 1912.