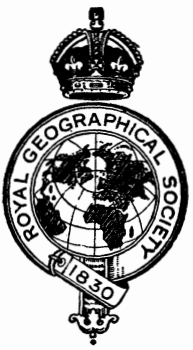
THE GEOGRAPHICAL JOURNAL



PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL
EDITED BY THE SECRETARY

VOL. LX.—JULY TO DECEMBER 1922

LONDON
THE ROYAL GEOGRAPHICAL SOCIETY
KENSINGTON GORE S.W.7
EDWARD STANFORD, LTD. 12 LONG ACRE W.C.2
1922

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

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No. 3. September 1922.

No. 6. December 1922.

in the interests of economy the Treasury were unable to provide the necessary funds for publishing the various lists of names, and though this Society has contributed as much as we can afford we have been obliged to make appeal to every kind of society and institution for aid to carry on a work which will do so much to aid in the proper pronunciation and transliteration of names of places and geographical features in foreign countries and prevent confusion in identifying them.

During the present Session we tried the experiment of holding informal receptions in the evenings at the Society's house. But, except on one or two occasions when something of special interest was on exhibition, they were not well attended, and it will probably be well in future only to hold them for some special purpose.

As this is my last Presidential Address, I take the opportunity to acknowledge my indebtedness to Mr. Hinks. He devotes his abilities and energies whole-heartedly to the affairs of the Society, and conducts them with thoroughness and competency. The preparations for the Mount Everest Expedition added greatly to his labours, but the efficiency with which it was organized was largely due to Mr. Hinks.

In closing my address I would once again thank the Society for the honour which you did me in electing me your President, and I would express the hope that I have carried out my duties to your satisfaction.

THE NATURAL HISTORY OF SOUTH-WESTERN TIBET

A. F. R. Wollaston

Read at the Meeting of the Society, 20 *February* 1922.

TO a naturalist Tibet offers considerable difficulties; it is true that in many places animals are so tame that they will almost eat out of your hand. In the Rongbuk valley the burrhel come to the cells of the hermits for food, and in every village the ravens and rock doves are as tame as the sparrows here in London. But against this tameness must be set the Buddhist religion, which forbids the people from taking life. So, in order to avoid giving possible offence, we had to refrain from shooting in the neighbourhood of monasteries and villages, and that was a very severe drawback, as birds congregated principally about the cultivated lands round villages. In spite of this disadvantage we made considerable collections of mammals and birds, and we brought back a large number of dried plants and seeds, many of which it is hoped will live in the gardens of this country.

Crossing over the Jelep La from Sikkim into Tibet in the latter part of May, we found the country at 12,000 feet and upwards at the height of Spring. The open level spaces were carpeted with a purple primula (*P.*

gammieana) and a little yellow flower (*Lloydia*) and many saxifrages. The steep hillsides were ablaze with the flowers of the large rhododendrons (*R. thomsoni*, *R. falconeri*, and *R. aucklandi*,) and the smaller *Rhododendron campylocarpum*, an almost infinite variety of colours. A descent through woods of pines, oaks, and walnuts brought us to the picturesque village of Rinchinggong, in the Chumbi valley. Here we found house martins resting under the eaves of the houses. From Rinchinggong we followed the Ammo Chu, the river of the Chumbi valley, upwards for four long days to its sources in the Tibetan plain. In its lower course, between 9000 and 12,000 feet, the valley was gay with pink and white spiræas and cotoneasters, red and white roses, yellow berberis, a fragrant white-flowered bog-myrtle, anemones, and white clematis. Dippers, wagtails, and the white-capped redstart were the commonest birds along the river-banks. About 12,000 feet is a level terrace, the plain of Lingmathang, where the stream meanders for 2 or 3 miles through a lovely meadow covered in the spring with a tiny pink primula (*P. minutissima*): it looks a perfect trout stream, but what fish there are are few and small in size. Between 12,000 and 13,000 feet you ascend through mixed woods of pine, larch, birch, and juniper, with an undergrowth of rhododendrons and mountain ash. The larches here have a much less formal habit of growth than those of this country, and in the autumn they turn to a deep golden colour. The berries of the mountain ash, when ripe, are snow-white and very conspicuous. In the woods hereabouts may often be heard and sometimes seen the blood-pheasant, and here also, though we did not see it, lives the Tibetan stag.

At about 13,000 feet at the end of May you find the yellow primula covering the ground more thickly than cowslips in this country; the air is laden with the scent of it, and growing with it is the pretty heath-like flower (*Cassiope*) with snow-white bells. Here and there were one or two of the large blue poppy (*Meconopsis sp.*), and a white anemone with five or six flowers on one stem. Soon the trees get scantier and scantier, pines disappear altogether, and then birches and willows and junipers, until only small rhododendrons are left, covering the hillsides like purple heather. In a few miles the country changes in character completely, and you come out on to the open plain of Phari. Here at 14,000 feet we saw the common cuckoo sitting on a telegraph wire and calling lustily. This is Tibet proper, and henceforward you may travel for many hundreds of miles and hardly see any plant more than a few inches high. In some places a little purple flower (*Incarvillea younghusbandii*) is fairly common; it lies prone on the sand with its leaves buried out of sight, and as we went westward we found the dwarf-blue iris (*I. tenuifolia*). Animals are few and far between. The kiang, the wild ass of Tibet, is occasionally seen in small parties, and now and again a gazelle; the Tibetan gazelle may sometimes be seen, two or three of them, in company with a flock of native sheep, and taking no heed of the shepherd, but when a stranger tries to

approach they are off like a flash. The only mammals that are commonly seen are the small mouse-hares or pikas (*Ochotona*), which live in colonies on the less stony parts of the plain, where their burrows often caused our ponies to stumble; they scurry off to their holes at our approach, but if you wait a few moments you will see heads peeping out at you from all sides. These gentle little creatures have been called whistling hares; they are not hares, nor do they whistle. The Tibetan name for them is Phüsi, pronounced very much like our pet name for the domestic cat. It may be interesting to record that on one of the pikas I found three fleas of two species, both of which are new to science. Larks of two or three species, wheatears, and mountain finches are about the only birds to be seen on these stony wastes. A small spiny lizard (*Phrynocephalus*) is common up to 17,000 feet; it lives in burrows under stones.

Rising out of the plain north of the Himalayas are ranges of limestone hills, 18–19,000 feet high, running roughly east and west. The hills between Phari and Khampa Dzong are the home of the big sheep (*Ovis hodgsoni*) which are occasionally seen in small companies. On the slopes of these hills are partridges (*Perdix hodgsoniæ*), and in the gorges are seen alpine choughs, rock pigeons, and crag martins. Once or twice at night we heard the shriek of the great eagle-owl, but it was never seen. At rare intervals on these plains one meets with small rivers, tributaries of the Arun river and so of the Ganges. Beside them there is usually more grass than elsewhere, and here the wandering Tibetan herdsmen bring their yaks to graze. The wild yak is not found anywhere in this region. It might be supposed that so hairy an animal as a yak would become dirty and unkempt. Actually they are among the cleanest of creatures, and they may often be seen scraping holes in soft banks, where they roll and kick and comb themselves into silky condition. Another animal of the plains is the Tibetan antelope (*Pantholops hodgsoni*), which is found a little to the north of the region we visited, but the only signs of it we saw were the horns used as supporting prongs for the long muzzle-loading guns of the Tibetans. This animal was probably the Unicorn described by the French priest Huc in 1845.

Here and there the rivers overflow their banks and form lakes or meres, which in the summer and autumn are the haunt of innumerable wildfowl; bar-headed geese and redshanks nest here, families of ruddy shelducks (the Brahminy duck of India) and garganey teal are seen swimming on the pools. Overhead fly sand-martins, brown-headed gulls, common terns, and white-tailed eagles. Near one of these lakes one day I watched at close distance a red fox stalking a pair of bar-headed geese, a most interesting sight, and had the satisfaction of saving the birds by firing a shot in the air with my small collecting gun just as the fox was about to pounce on his intended victim.

Tinki Dzong is a veritable bird sanctuary; the Dzong itself is a rambling fort covering a dozen or so of acres, and about its walls nest

hundreds of birds, ravens, magpies, red-billed choughs, sparrows, hoopoes, redstarts, wagtails, and rock doves. In the shallow pool outside the Dzong were swimming bar-headed geese and ruddy shelducks with families of young, all as tame as domestic poultry. The Dzongpen explained to me that it was the particular wish of the Dalai Lama that no birds should be molested here, and for several years two lamas lived at Tinki, whose special business it was to protect the birds.

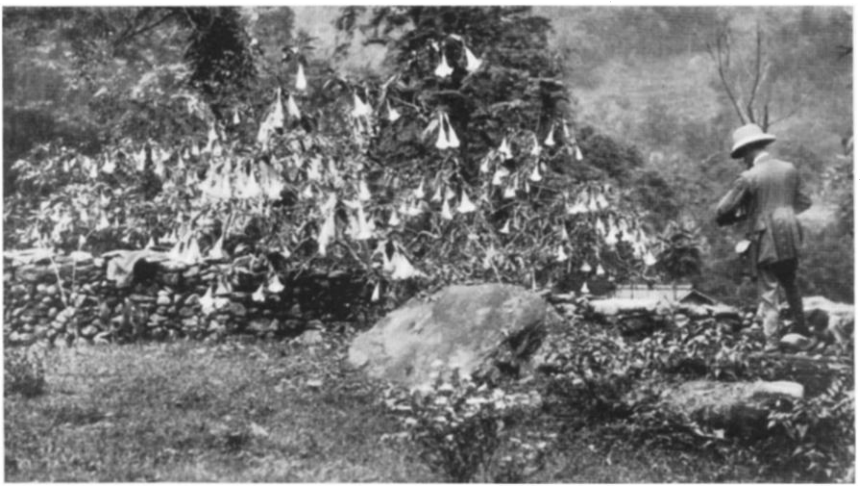
Crossing over a pass of about 17,000 feet, the slopes gay with a little purple and white daphne (*Stellera*), said by the natives to be poisonous to animals, we came in about two days to a plain of a different character, miles of blown sand heaped here and there into enormous dunes, on which grows a yellow-flowering gorse. In the wet season this plain becomes a huge lake at the junction of the Arun river and the Bhong Chu, and it was from here that we saw our first view of Mount Everest.

Following up the valley of the Bhong Chu we crossed the river by a stone bridge near Shekar Dzong. Here we found a colony of white-rumped swifts nesting high up in cliffs and ruddy shelduck nesting in holes among the loose boulders below. The slopes facing south were covered with a very pretty blue-and-white flowering shrub (*Sophora*); the foliage is a delicate silvery grey, and the plant would be a great ornament to English gardens.

At Tingri we found ourselves in a large plain about 20 miles long by 12 miles wide: a large part of the plain is saturated with soda, and is almost uninhabited by bird or beast. Along the rivers which traverse the plain is very good grazing for large flocks of sheep and goats. The sheep are small and are grown entirely for wool; the flesh, which was our principal food while we were in Tibet, has a pronounced flavour of lanoline. By means of a simple system of irrigation a large area of land near Tingri has been brought into cultivation. The principal crop here is barley, which constitutes the chief food of the people; they also grow a large radish or small turnip, the young leaves of which are excellent food. Iron ploughshares are imported from Nepal, and ploughing is usually done with a couple of oxen. The animals shown in the picture are a cross between the ordinary domestic ox and the yak, called by Tibetans "zoh." They are more powerful than the yak, and are excellent transport animals. We found barley grown in many districts up to 15,000 feet—it does not always ripen—and in the valley of the Dzakar Chu, near its junction with the Arun, is a small area where wheat is grown at an altitude of about 12,800 feet. Peas are grown in the Arun valley near Kharta, where they ripen in September and are pounded into meal for winter food of cattle as well as of the Tibetans themselves. I regret to say that I did not bring back specimens of these interesting and hardy cereals.

In the month of July Major Morshead and I made an excursion over about 150 miles of unknown country to the south-west of Tingri. Across the plain we came first to the village and monastery of Langkor, an

YELLOW PRIMULAS, UPPER TEESTA VALLEY, JUNE



DATURAS AT RONGLI

PLOUGHING WITH ZOH (OX × YAK)

EDELWEISS AT 16,500 FEET

HEADMAN OF KHARTA

important place of pilgrimage among Tibetan Buddhists. There is a pretty legend relating to the place, which ought to be remembered :—

Many generations ago there was born in the Indian village of Pulahari a child named Tamba Sangay. When he grew into a youth he became restless and dissatisfied with his native place, so he went to the Lord Buddha and asked him what he should do. The Lord Buddha told him that he must take a stone and throw it far, and where it fell there he should spend his life. So Tamba Sangay took a rounded stone and threw it far, so that no man saw where it fell. Many weeks and months he sought in vain until he passed over the hills into Tibet, and there he came to a place where, although it was winter, was a large black space bare of snow. The people told him that the cattle walked round and round in that space to keep it clear from snow, and in the middle of it was a rounded stone. So Tamba Sangay knew that the stone was his, and there he made a cell and dwelt until he was taken on wings to heaven. And the place is called Langkor, which means "the cattle go round," to this day. The people for many miles about had heard the stone as it came flying over the hills from India ; it made a whistling sound like "Ting," so the country came to be called Tingri, the Hill of the Ting.

Going west over the Thong La, at about 18,000 feet we found for the first time the beautiful little gentian (*G. amœna*). It is not easy to see until you are right over it, when it looks like a little square blue china cup ; some of the flowers are as much as an inch in diameter. Here also was just beginning to flower the dwarf blue poppy (*Meconopsis horridula*), one of the most beautiful plants in all that country. It grows in a small compact clump 6 to 8 inches high, with as many as sixteen flowers and buds on one plant. The flowers are nearly 2 inches across and of a heavenly blue. Going down from the Thong La we found, at about 16,000 feet, large colonies of marmots. The Himalayan is larger than the Alpine marmot, and it has a longish tail which it whisks sharply from side to side when it is alarmed : it has a twittering cry, curiously like that of a bird of prey.

Farther on the stream we were following opened out into an almost level valley about a mile wide, bounded on either hand by rounded limestone hills. Here and there were small villages, in the neighbourhood of which were numerous hares : it may not be generally known that the hare is occasionally a very foul feeder. The inhabitants have made very elaborate irrigation works in this valley, and here for the first time we saw crops of mustard, which add welcome splashes of colour to the rather drab landscape and have a delicious scent in the sunshine. The mustard seed is crushed for oil, which is burnt in monastery lamps.

At Nyenyam we found ourselves near to the great mountain Gosainthan (26,291 feet), of which I had had a glimpse from 20 miles' distance, two glorious peaks like mighty Matterhorns ; but though we walked many miles up the main valley leading towards it, we saw nothing but fog. On

an island in the torrent of that valley I saw a pair of the curious curlew-like birds, the ibis-bill (*Ibidorhynchus*), evidently with eggs or young, but it was impossible to reach them. The most conspicuous flowers in this valley were a little bushy cistus with golden flowers the size of a half-crown, a white potentilla with red centre, which carpeted the drier hill-sides, and a very remarkable louse-wart (*Pedicularis megalantha*) with two quite distinct forms, one purple, the other yellow.

At Nyenyam the river we had been following from the Thong La plunges into a gorge many thousands of feet deep and cuts through the main chain of the Himalaya to join the Kosi, a tributary of the Ganges, in the lowlands of Nepal. Turning back eastwards in the direction of Mount Everest we crossed several passes of 17,000 or more feet and valleys narrowing into gorges similar to that of Nyenyam. Going up to one of these passes, we found at an altitude of about 15,000 feet the ground for an acre or more covered with an almost pure white primula with a very delicate primrose scent (*Primula buryana*). Near there passing through the holy mountain-side of Lapche Kang we came to the temple of Lapchi, which is well known to all Buddhist India and Tibet, and is visited by thousands of pilgrims yearly. This was formerly the abode of Mila Respa, a Tibetan incarnation of Buddha. He lived in this mountain valley, and the faithful may still see his footprints in certain caves. He seems to have been an unusual kind of saint, who liked to have his little joke. The following story, which was told by the lama in charge of the temple at Lapche, has a certain interest for naturalists, and may be related here :—

He was walking with a disciple on the mountain one day, when they found an old yak's horn lying in the path. Mila Respa told the disciple to pick it up and take it with him. The disciple refused, saying that it was useless, and passed on not noticing that the saint himself had picked up the horn and put it under his cloak. Soon afterwards a mighty storm descended on them—whether or not it was caused by the saint is not known. He took the horn from under his cloak and crept inside it. "Now," said he, when he was safely sheltered from the rain, "you see that nothing in the world is useless."

Growing about the rocks in this neighbourhood is a very pretty pink-flowered polygonum (*P. vacciniifolium*), which rambles somewhat after the manner of a cotoneaster. A bird which I did not see elsewhere in Tibet was the wall-creeper, which was constantly seen climbing about the temple and the big boulders of Lapche.

Going south and east from Lapche we crossed more high passes, and near the top of one of them we found one of the most beautiful blue primulas in the world. Each flower has from three to six bells about the size of a thimble, lined inside with a kind of frosted silver (*P. wollastonii*). It was not long after finding this blue primula that we saw for the first time in nearly three weeks one of the great snow mountains that surrounded

us. During most of that time we had seen little but clouds and fog. Apart from the remarkable beauty of its form this peak has a peculiar interest of its own. Our friends the late enemy always insisted on labelling Mount Everest Gaurisankar, but this mountain 36 miles west of Everest is the true and only Gaurisankar (*Journal*, Feb. 1922, No. 22). At the foot of this mountain flows the Rongshahr river, at this point about 10,000 feet above sea-level. We followed up the Rongshahr valley, notable at that season of the year for its excellent wild gooseberries and its red roses, to the Phüsi La, and thence we followed the tracks of Colonel Howard-Bury and other members of the expedition to Kharta in the Arun valley, about 20 miles east of Mount Everest.

Kharta is curiously situated as regards climate—the wide dry open valley of the Arun narrows abruptly and the river passes into a deep narrow gorge, where it falls rapidly at the rate of about 200 feet to the mile. The monsoon clouds roll up the gorge to its mouth, where they are cut off sharply, so that within a mile you pass from the dry climate of Tibet to the moist steamy air of a Nepalese character with its luxuriant vegetation. The Kharta valley joins the Arun here from the west, and is practically on the border between these two climates, getting many hours of sunshine in the day and very frequent falls of rain, with the result that the crops of barley grown are as fine as can be seen anywhere. There is a considerable population, of a more enlightened kind than we had met hitherto; some of them even grow flowers for pleasure. The gentleman shown in the plate, our particular guardian at Kharta, was not only an accomplished musician and dancer, but he was also a keen horticulturist; he had a pretty garden of his own, and one day he presented Colonel Howard-Bury with a pot in which were growing marigolds, kosmos, a mallow, and some barley.

About the larger houses in this region are usually planted poplars and junipers, and it was about 10 miles from Kharta that we saw a big poplar nearly 40 feet in girth; we were told that it was 500 years old.

From Kharta we made excursions to the Kama valley, a journey of about two days to the south-west. After climbing to a low pass of 15,000 feet we came to a valley filled with a dozen or so of small lakes or tarns of wonderful colours. They appeared to be inhabited only by tadpoles; no signs of fish were seen. Here were growing large beds of purple and yellow iris (allied to *I. sibirica*); the steeper banks were blue with a very striking campanula (*Cyananthus pedunculata*), growing out from the dwarf rhododendrons in dry places were tall spikes of a claret-coloured meconopsis, now going to seed—some spikes had as many as twenty seed-pods—and growing in the moist places beside the lakes and streams was the tall yellow primula (*P. elongata*), growing to a height of 30 inches. Over another pass, the Chog La (17,000 feet), we began to go down into the Kama valley. At about 14,000 feet we picked a quantity of wild rhubarb, a far better vegetable than the tame variety; and a little lower

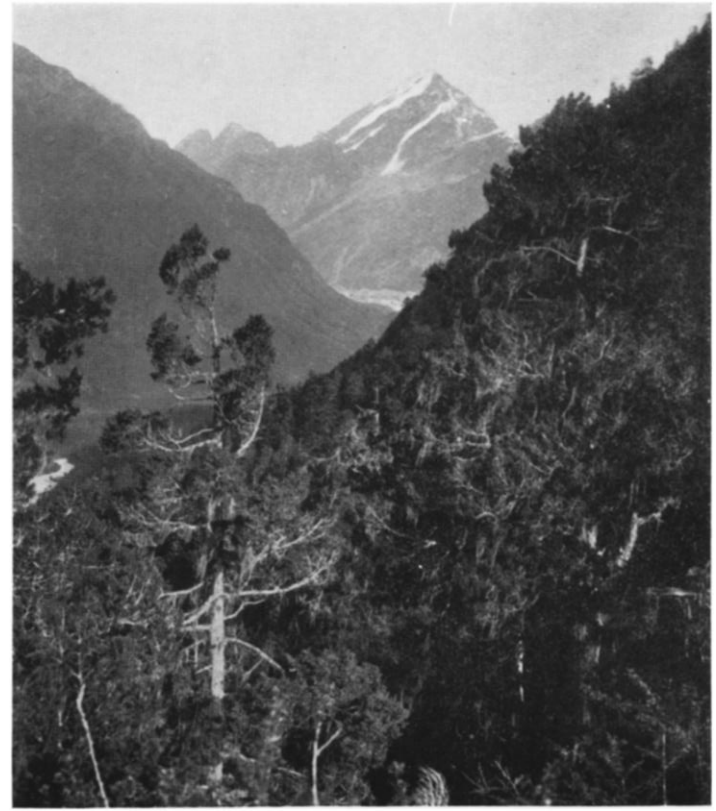
down we came to large blue scabious, 3 to 4 feet high, a big dark blue monkshood, and quantities of the tall yellow poppy. Rhododendrons, birches, and junipers begin at about 13,500 feet, and at 12,000 feet the junipers are the predominating tree; they are of immense size, upwards of 20 feet in girth and 120 to 150 feet high, and of a very even and perfect growth. Here we met with the Sikkim black titmouse (*Parus beavani*), and a little lower down amongst the silver firs (*Abies webbiana*) we came upon bullfinches (*Pyrrhula erythrocephala*). At 11,000 feet I saw a langur monkey (*Semnopithecus entellus*), the only monkey we saw in Tibet. In the open spaces among the trees grew many parnassias, a tall green fritillaria, and a very sweet-scented pink orchis. We went down through bamboos, rhododendrons, and magnolias to the almost tropical heat of Lungdö, about 8000 feet, near the junction of the Kama with the Arun river, where the blue pine grows. After an excursion to the Popti La, one of the principal passes from Tibet to Nepal, where we were astonished to find at 12,000 feet an abundance of very active leeches, we returned to Kharta.

Early in September we started up the Kharta valley on our way towards Mount Everest; by that time the harvest of peas and barley was already begun. At this season the rhododendrons and many other plants were beginning to seed, but some of the gentians were at their best, particularly *Gentiana ornata*, which carpeted the ground with a variety of blues. Near our camp at 17,000 feet, along the edges of streams, a very handsome dark blue gentian (*G. nubigena*) with half a dozen flowers growing on a single stem was very conspicuous, and growing with it was an aromatic little dwarf purple and yellow aster (*A. heterochæta*). In the stony places grew up to 19,000 feet the dwarf blue poppy (*M. horridula*) mentioned above, and many saxifrages, notably a tiny little white one (*S. umbellulata*). On the steeper rocks from 16,000 feet to the snow-line (roughly 20,000 feet) were found edelweiss (*Leontopodium*) of three species. Very noticeable at these altitudes are the curious saussureas, large composites packed tight with cotton-wool: if you open one of them on the coldest day, even when covered with snow, you find it quite warm inside, and often a bumble-bee will come buzzing out.

Another very interesting plant at 17–18,000 feet is a dwarf blue hairy delphinium (*D. brunonianum*) with a strong smell. The Tibetans dry the flowers of this plant and use them as a preventive against lice, without conspicuous success. When a Tibetan dies, his body is undertaken by the professional butcher, who cuts it up and exposes it on the hills to be disposed of by the vultures and wolves. A body tainted with the delphinium flowers is unpalatable to the scavenger, and it is well known that a man must have been wicked in life whose body is rejected by the vultures and wolves. The highest plant we found was a little Arenaria which grows among the loose stones to 20,000 feet and above.

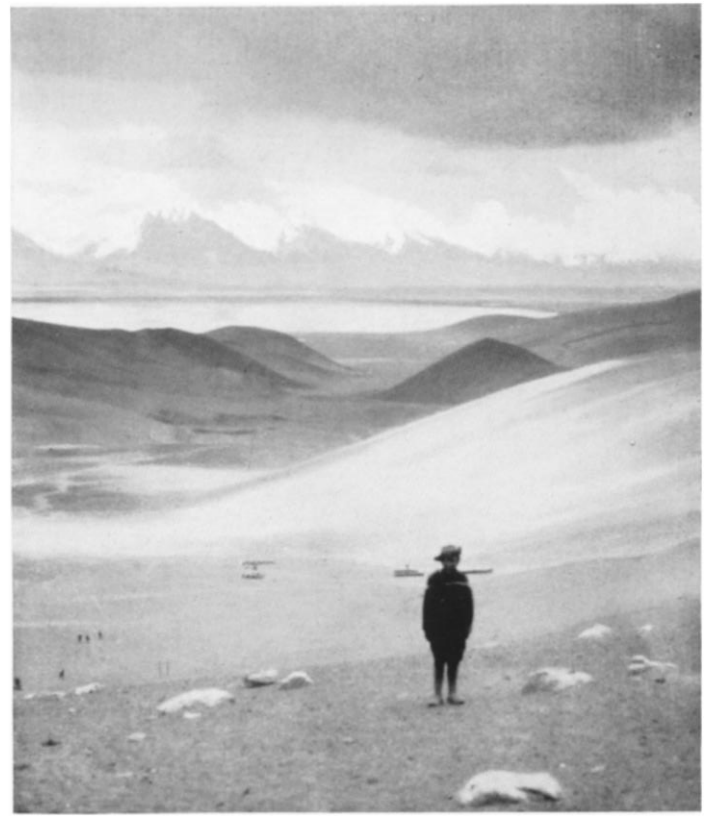
Animal life above 17,000 feet is scanty. Our camps at 17,000 and

LEPCHA COLLECTOR HOLDING *SAUSSUREA*



LOWER VALLEY OF THE KAMA CHU

500 YEAR OLD POPLAR AT LUMEH



LOOKING BACK TO DOCHEN

20,000 feet were visited daily by ravens, black-eared kites, red-billed and alpine choughs, and lammergeiers. The large Tibetan snow-cocks were very conspicuous and noisy on the slopes between 17,000 and 20,000 feet. Pikas (*Ochotona*) of a new species was found from 15,000 feet to the snow-line, and small voles were common at 17,000 feet. At about the same altitude a small black rat lived among the great boulders of the moraines, but we never succeeded in catching one, and in the same place lived a very dark brown wren of a new species of which only one young bird was brought home. Mice of some kind came into our tents at 20,000 feet and ate our food, but escaped without being seen. Burrhel were often seen at 18–19,000 feet and their tracks at 20,000 feet. Wolf, fox, and hare were all seen above 18,000 feet, and undoubted tracks of both fox and hare were seen on the Kharta glacier at 21,000 feet, at which height also I saw a hoopoe flying across the glacier, and a small hawk, which appeared to be almost white underneath, flying swiftly overhead.

A few hundred feet higher, about 21,500 feet, we came across those tracks which afforded such fun to so many people. It is not necessary to assure a scientific society that there are no such creatures as "abominable snow men," that apes are not alpine climbers, and that Himalayan bears do not make excursions to 10,000 feet above the last fruit-bearing tree. There can be no doubt, I think, that the tracks we saw were those of a wolf loping along at a good gait; the snow was soft, and the tracks had got partially merged together. Curiously enough, I have in my own experience come across similar stories of wild men in high mountains in such widely separated regions as Ruwenzori in Central Africa and in Dutch New Guinea, and I believe them all to be equally devoid of foundation.

The photograph (*Journal*, Feb. 1922, No. 21) taken from our camp on Lhakpa La (22,350 feet) is interesting not only because it shows the north col and the beginning of the slope by which the attempt on Mount Everest is to be made, but also because when I was taking this photograph I saw come sailing over this peak to the right, that is the north peak of Everest, 24,730 feet high, and apparently high up above the peak, a lammergeier or bearded vulture, a bird which soars and sails and never flaps its wings except at the moment of getting off the ground. The means by which so large a bird moves without effort in so rare an atmosphere, about one-third of the normal, is worthy of the attention of aviators.

The photograph of the summit of Mount Everest (*l.c.* No. 12) has another significance for diligent inquirers. For some weeks before we came within reach of the great mountain we heard from the natives rumours of the Snow Frog. This mysterious reptile is said to live only at the tops of the highest mountains, and its blood is an unfailing remedy for all diseases of the body and of the soul.

Much has been written and talked about the wonderful colours of

Tibet; it is impossible to exaggerate them, and it is much to be hoped that this year's expedition will bring us back something more than photographs. But nothing has been said about that country's smells. I am not thinking so much of the rank savour of a Tibetan village, nor of the peculiar bouquet of the Tibetan person, nor of the acrid taste of the smoke of yak-dung which flavoured all our food for five months. I am thinking rather of valleys laden with the smell of roses, of meadows carpeted with sweet-scented primulas, and of the delicious fragrance of rhododendron leaves trodden underfoot on a frosty morning in September. These are things which we shall remember long after the petty worries of Tibetan travel are forgotten.

In conclusion, I must thank the authorities of the Natural History Museum and of Kew Gardens for the care with which they have worked out our collections.

Before the paper the PRESIDENT said: It was a very great disappointment to us that at our Mount Everest Meeting at the Queen's Hall at the end of December, time did not permit of Mr. Wollaston giving us an account of the natural history of the Mount Everest region. That disappointment is made up for by our having him here this evening, when we can hear his account at far greater length and shall have the advantage of being able to discuss it in a way we should not have been able to do at the Queen's Hall. I have great pleasure in introducing to you Mr. Wollaston, the distinguished naturalist of the Mount Everest Expedition.

Mr. Wollaston then read the paper printed above, and a discussion followed.

Sir DAVID PRAIN (Director, Royal Botanic Gardens, Kew): I will not at this hour detain the audience long, but I would like to take this opportunity of saying to the President of the Society, to the members, and to those who have been responsible for organizing the Expedition, how great a pleasure it was to me to have an opportunity of assisting in working out the small collection of plants that Mr. Wollaston and his friends were able to make. A predecessor of mine in Calcutta, Dr. Wallich, as long ago as 1821 was asked to visit Nepal when Sir Robert Colquhoun of Luss was the Resident there and was able then to arrange to secure collections of plants from Gosainthan. Another predecessor of mine in Calcutta, Sir George King, from 1871 onwards made it his business to endeavour to have a complete survey made of the vegetation of the valley of Chumbi and the plain of Phari to the north of it. Knowing as we did practically the whole of the plants from Chumbi and Phari to the east, and having very considerable collections from Gosainthan to the west, it was not to be expected that many new plants would be brought home by the Mount Everest Expedition. A certain number there are; six or seven, perhaps, and you could not help finding a few when so large an area was so carefully examined by the members of the party. But the great interest of the collection is that it fills up a gap between two areas that have been fairly well known; one for about a hundred years and the other for about fifty years. The lousewort that Mr. Wollaston has mentioned is a very handsome plant in both its forms, one with pink blossoms, the other with yellow. It is very interesting

to me, because I happened to make a special study of those plants a number of years ago—I do not like to say how many now—and I found then that the yellow one is a very characteristic plant of the North-West Himalaya, whereas the pink form is an equally characteristic plant of the Eastern Himalaya. Except as regards the colour of the flower, it is really hardly possible to distinguish one from the other, and it is extremely interesting to find that Mr. Wollaston had the privilege of being just in that part of the Himalaya where the areas of these two plants meet and to see them slightly overlap. In conclusion, may I repeat the pleasure it has given me to see those plants, and to say how indebted we all are to the Mount Everest Committee for having enabled the members of the Expedition to make a collection of plants for us?

Sir SIDNEY F. HARMER (Director, Natural History Museum): It is a special pleasure to obey your commands, Mr. President, and make one or two remarks with regard to Mr. Wollaston's address this evening, because he is an extremely old friend of mine whose acquaintance goes back to the time when he first entered as an undergraduate at a Cambridge College. Since then I have been further indebted to him by being able to read some of his charming books in which he has described the results of his travels abroad, books in which his word-pictures have been so vivid that they are capable of transporting one to the localities described and helping one to enjoy the pleasures of travel which one will probably never be able to experience in one's own person. In the course of his remarks this evening Mr. Wollaston gave us a very interesting story showing that even the discarded horn of a yak is not without its utility. I think it was somewhat earlier in his remarks that he mentioned the fact that he had discovered two species of fleas, and I noticed at the time that there was a little disposition to think that a subject for mirth. If the earlier story had preceded the mention of the fleas, you would perhaps have taken a somewhat different view of it, because if there is one thing that is certain it is that the systematic study of fleas is one of the really important things in this world. I do not mean that to be a humorous statement. I believe it to be strictly and literally true. In large areas of the world the plague is transmitted by the agency of fleas, and a knowledge of the species and the life-history of those insects is of the very greatest importance. By a curious coincidence Mr. Wollaston also mentioned the subject of marmots, and here again the marmot is an animal which has been accused of being largely instrumental in transmitting one of the most dreaded diseases that occur in the Asiatic continent, the disease known as pneumonic plague. We may safely assert that even in cases where the study of a particular animal would appear to have very little significance, it may, on the contrary, be of the greatest importance. But quite apart from the possible economic aspects of the question, we are extremely interested in knowing what there is to be found in the region of Mount Everest, and in any unexplored part of the world. I have great pleasure in welcoming any co-operation between this Society and the Natural History Museum in further investigating questions of this kind. The fauna of Mount Everest was of interest to us largely because it is a part of the world which has been quite unknown zoologically, and from which we had no collection. A theory has recently been propounded to the effect that the mountain summits are places where life probably originated on this globe, the idea being that when the world was cooling down the mountain summits were the first places which came to acquire a temperature sufficiently low to allow life to come into existence. I may say at once we did not expect to find

any trace of this ancient history, even if that theory should be correct, which is by no means certain. The mountains are probably far too recent for that. But Mount Everest was a district of which we knew very little, and we are extremely glad to have had this opportunity of learning more. We could hardly expect that, standing as it does on the line between the great Palæarctic area to the north and the Oriental region to the south, we should find anything of extraordinary novelty. In this respect our experience corresponds with that of Sir David Prain. No conspicuously new types of animals were discovered, but we did not expect it. The collection consisted largely of birds, among which we found not only representatives of species commonly seen in our own country, but also representatives of other birds not quite the same, but differing specifically from those we have here. One of the interesting results was in connection with certain birds which were found nesting high up on Mount Everest. It is well known that some of these birds, waders in particular, are in the habit of seeking high latitudes, such as the Arctic Circle, for instance, in which to nest. Why they do it is perhaps not quite obvious. But it is interesting to find that here we have a case in which a bird, instead of going a long journey towards the far north, is able to reach a high altitude and thus get the sort of Arctic conditions in which it rejoices in order to undergo its nesting period. Then in addition to birds there is an interesting little collection of mammals, including a new form of the animals which Mr. Wollaston has referred to as whistling hares. We are rather disappointed that he did not bring home any of the rats and mice which he has told us invaded their tents at certain times, but we hope that the next Expedition will be more successful in this respect and that the animals in question may prove interesting. In addition to this the collection included a few insects, there being some butterflies and moths and one or two batrachians, and among the latter a very interesting new form. The collection is one which we are extremely glad to have, and we are greatly indebted to the Expedition and to Mr. Wollaston for having made this addition to our national collection.

Mr. N. B. KINNEAR: Mr. Wollaston is to be congratulated on the collection which he has brought back. We have heard of the number of things he had to do: besides collecting animals, he had to collect plants and at the same time look after the health of members of the Expedition. The first thing that strikes one on looking at the collection of birds is the extraordinary worn state of plumage which most of the specimens are in. This I think is due, to a great extent, to the high elevation at which the birds were taken, and probably, in the more exposed parts, to the winds to which they were subjected. In a general survey of the collection one finds, of course, that the birds come from a great variety of localities, so it is rather difficult to generalize, but about a half are resident or semi-resident in the Himalayas, that is, birds which move up and down the Himalayas according to the seasons. Of these we might mention the four different kinds of Accentors, birds like hedge-sparrows; the different kinds of finches, Rose Finches, Snow Finches and the Ground Finches; Cinnamon and Tree-sparrows; Snow-pigeon and Snow-partridge. About a quarter of the birds are made up of summer visitors, which simply go to these high altitudes for the purpose of nesting, and during the cold weather are found in the plains of India. These include the Indian Stonechat, Desert Wheatear, Hodgson's Rose-finch and the Short-toed Lark, Redstarts, Wagtails, several Pipits, a Redshank and the Tibetan tern. A few birds are confined entirely to the northern side of the Himalayan Range; we do not get them on

the southern slope at all. They are the Brown Ground Chough, a small bird about the size of a thrush with a bill like a chough, which runs about the ground and goes in small flocks; Prince Henry's Babbler, Walton's Turte, and perhaps the Tibetan Sky-lark, described some years ago from the south-east of Tibet, its breeding ground being at the head of the Chumbi Valley. Where this last bird goes in winter is not yet known. There are in the collection only two birds which were true migrants, birds which were simply passing through. One is Temminck's Stint and the other a wagtail. Perhaps the most curious bird of the whole collection was the Pied-crested Cuckoo. This is a very common bird in the plains of India, and as a rule it is never found above 5000 feet, but extends from Kashmir right down to Cape Comorin and is a local migrant. In the beginning of the monsoon a certain number of them come to Bombay, and for some reason or other they are always pursued and harried by the common House Crows. Why they do it, I do not know, because this cuckoo does not lay in the House Crow's nest, but in the nest of babblers. One can only suppose that this cuckoo in the foothills of the Himalayas was mobbed by House Crows and started wandering up, gradually lost itself, and eventually turned up at, I think, about 14,000 feet. Temminck's Stint, about the size of a sparrow, which nests on the borders of the Arctic Ocean, was very interesting, especially because I think Mr. Wollaston told me the place at which it was found was about 17,000 feet, and to get there it had to fly over a range of 22,000 feet. This shows that high mountain ranges are no barrier to some birds, at least on migration. This is very interesting to learn. Of course we knew a certain amount about the heights over which birds will migrate from the observations made by the different naturalists on the first and second Yarkand Expedition. As Sir Sidney Harmer said, a certain number of the birds are very similar to those found in this country. I might mention the Himalayan Blackbird, which is practically the same as our blackbird, only it is larger; the Tree Sparrow, the Redshank, and Hodgson's Rose-finch which is very similar to the Common Rose-finch; the Hoopoe, Temminck's Stint, and the Dusky Redshank are all the same as you get in this country; and the Indian stonechat, which is very like our stonechat but slightly different, has been found in Norfolk on migration. The Himalayan Alpine Accentor, which was one of the birds seen highest up, is very like the Alpine Accentor found in the Swiss Alps, and one of the snow-finches, Adams' Snow-finch, discovered a great many years ago in Ladak, is practically the same as the snow-finch of the Alps. I do not think there is anything more to say about the birds. They are an interesting collection.

Mr. W. R. DYKES (Secretary, Royal Horticultural Society): I did not at all expect to be called upon to make any remarks on the seeds found during this interesting Expedition. If I may say so, what we have realized so far is that a great number of these plants may be difficult to grow in this country. The various kinds of Meconopsis especially are very difficult, and so are the high Alpine primulas. This year we should be very glad to get seeds of the cereals and of the common plants. Mr. Wollaston told us of the wild gooseberries which they ate going up one of the valleys, but we have not yet got seeds of that gooseberry, although we should be glad to have them. Then I believe a raspberry was found high up of which we should also like to have seeds, and we hope that the results of the Expedition of last year will show those who go out this year that even the commoner plants might be brought back and prove of more permanent value in this country than some of the seeds we have already received, such as the various species of meconopsis and

primula. The irises mentioned interested me especially ; all that I have seen of the seeds that have been brought back are of the Sibirica section. There are, we know, several irises closely related to the *Iris sibirica* in the Chumbi Valley and higher up. But I think the yellow and purple iris which Mr. Wollaston mentioned as growing high up is probably unknown to us, and I think not *nepalensis* but some other species. I have not yet seen that specimen, and I did not know it had been identified as *nepalensis*.

Mr. FRESHFIELD : I feel somewhat abashed at following in the train of so many distinguished representatives of the Natural Sciences. To what has gone before I can, I fear, only contribute a single observation as to the high flight of migratory birds. On the Bezingi Glacier on the north side of the Caucasus, at the point where the watershed attains its maximum height, 15,000 to 17,000 feet, Signor V. Sella found the ice strewn with the skeletons of ducks, larks, and quails, besides others that were unrecognizable. The poor things had evidently been caught in a blizzard. But why, when they had an easy flight open to them along the coast of the Black Sea, did they choose to face the great ice-wall that towers over Suanetia ?

I turn to some more general remarks, which the fact that this is the last meeting at which we shall have any of the members of the 1922 Mount Everest Expedition with us before they start, may render not inopportune.

The other day my friend Captain Farrar, who has been so active in looking to the equipment of the party, accused me of being a pluralist on the ground that I was the only man who had served both as President of our Society and of the Alpine Club. I should not have run the risk of losing any reputation I may have for modesty by repeating Captain Farrar's remark to-night had I not recognized that it indicated and summarized a development of which the Mount Everest Expedition is the most notable expression. I refer to the union of our Society and the Alpine Club for a common object. Since the time, now over forty years ago, when I first became one of your Honorary Secretaries, the establishment of mountaineering in its proper place in the field of geographical discovery and research has been one of the principal objects of my life. There was a date, still within living memories, when in Savile Row we were so engrossed in African swamps and Arctic icebergs that we had little or no time for mountains. Here is one notable instance: so distinguished a traveller as Sir Joseph Hooker had to wait a quarter of a century after the publication of his classic ' Himalayan Travels ' before he received our Gold Medal. Those days are happily long past, and we may look forward with confidence to further co-operation between the Society and the Alpine Club in the exploration of the vast mountain region that spreads across Asia from China to Afghanistan.

Next I desire to congratulate the members of this year's expedition on having been successful where the Survey of India had after fifty years of intermittent endeavour succeeded only in failing. They have ascertained, and that through an official source, the local name for the highest mountain in the world. The Tibetan passport for the 1921 party was made out for the exploration of Chomolungma ; this, we are told, means being translated " The Mother Mountain of the Country." I am not going to revive to-night the old controversy as to the propriety of imposing upon the peak an English name. This, I fear, must now be allowed to be a matter settled for better or for worse. But I do desire to insist that the mountain's authentic local name shall henceforth be inserted on our maps (in brackets if you like) alongside of its English pseudonym. I urge this not only as a matter of courtesy to our Tibetan hosts, but also as one of proper regard to our own rules of nomenclature. We have laid down

that the ultimate authority as to geographical names is the Government of the country in which the objects are situated. The Monarch of Mountains rises not in British territory but in Tibet, and it is only by making a special exception to our rule that we can call it by any but its Tibetan name. May I in the same connection express my hearty sympathy with the action of our climbers in submitting Tibetan names—names that will be intelligible to the people of the district—for the minor peaks that they found to be nameless? This is what Prof. Garwood and I attempted to do twenty years ago in the neighbourhood of Kangchenjunga.

I have been led to mention Kangchenjunga. Allow me a brief digression. It is obvious that the Mount Everest Expeditions are likely to give a fresh impulse to Himalayan climbing and exploration. It may therefore be opportune to remind ourselves that there exists, a week's journey from Darjeeling, a mountain mass only 1000 feet lower than Mount Everest and accessible without frontier difficulties or political hindrances. I would invite the Indian Government to take steps to make it even more accessible. I recognize that the moment is unfavourable. The Government is hard up; we are all hard up. But the request I make is extraordinarily modest. Paths good enough for mules or laden coolies on both sides of the Guicha La, and for the few miles through the forest from Lachen to the foot of the Zemu glacier, a couple of stone huts, such as we have in the Alps, one at Alukthang, one on the Green Lake plain at the head of the Zemu; these facilities would enable mountaineers to penetrate the gaps and climb the minor peaks round Kangchenjunga and to explore further the approaches to that magnificent and most formidable mountain. They would further afford a party of surveyors a delightful opportunity to ascertain whatever errors Prof. Garwood and I may have fallen into in the map we produced, under difficulties, twenty years ago.

I return for a few last words to Mount Everest, but, since I have mentioned maps, may I here express a hope that a revised version of the general map of the mountains between Makalu and Gaurisankar, given with the February number of the *Journal*, may before long be produced by the Survey? In such a region a map that leaves out any indication of the main watershed is like the play without Hamlet, or rather like a play without any plot at all. The detailed map of the approach to Mount Everest, on the other hand, is highly commendable as an adequate and apparently correct representation of physical features and of the relation of the glaciers to the mountain structure. It is an interesting example of the use photographs may be in cartography.

Finally, the question before all our minds to-night is, "Can Mount Everest be climbed this year?" We have been told on the best authority that the chances are fifty to one against success. I am not in a position to dispute that statement. It is obvious that success must depend on a rare and happy combination of circumstances. First, the mountain must be in the best condition and the weather set fair; next, you must have the *right* climbers. By right I do not refer to climbing capacity, as to that we are assured we have the best men, but to individuals exceptionally immune from the effects of the rarity of the air. In this respect climbers vary greatly. At a height of over 20,000 feet I have seen some of my party run about in the snow as if they were on a beach at sea-level, while others were suffering from divers degrees of lassitude. For myself I felt nothing until I walked uphill, but then I lost breath relatively quickly; that was at the age of fifty-five. It is difficult to ascertain beforehand each individual's sensitiveness, and even in the same man his powers may vary on different days.

I would conclude with certain grounds for hopefulness brought to light by last year's reconnaissance. The final climb appears to offer no very serious obstacles except that of altitude. The next 4000 feet above the North Col are not too steep. Before the monsoon much of this slope may prove rock, and at any rate there are crags that promise sites for a bivouac at 26,000-27,000 feet. Easy rock is far less tiring than snowslopes. The final ridge above the shoulder looks roomy, though the last 200 feet may be steep. Exhaustion ensues far less quickly on airy ridges than in hot and soft snow basins. Nor need we infer from last year's experience that high winds prevail perpetually on the summits. During the two months I was in Sikkim in the autumn of 1899 I never met a gale or saw the snow flying from the ridges. We are not yet in a position to generalize.

Nil desperandum is a good motto for mountaineers. Hope for success, and imbue as far as possible your companions and followers with the same feeling. By so doing you will diminish the odds against you by one-half—they will still be heavy enough.

The PRESIDENT: Mr. Wollaston began his address by telling us how well the party were during last season. The Chinese go on the principle of paying their doctors as long as they are well and not paying them when they are ill. On that principle, I think we must congratulate Mr. Wollaston. Mr. Wollaston said that it was a misfortune that in certain places they were not allowed to shoot. This year the Tibetan Government have made a representation to us that the Expedition should not shoot in Tibet. That has the great disadvantage that the Expedition this year will not be able to bring back the same amount of natural history collections that the Expedition last year brought back. But, on the other hand, I hope they will have very special opportunities of observing wild life, which in Tibet is so much tamer than elsewhere. We have fortunately this year been able to send a special photographer, who will have nothing else to do but to photograph, and I am sure Captain Noel will take the hints that have been given this evening and bring us back photographs and cinematographs of the wild life of that country. So that it may not be altogether an unmixed blessing that there is to be no shooting. The time is late, but I know perfectly well that you will wish me to thank Mr. Wollaston for his exceedingly interesting address. It has been most fascinating to listen to him, and I think we are all rewarded by this opportunity that has been given us to make up for what we lost at the Queen's Hall.

THE TIGRIS ABOVE BAGHDAD

Lieut.-Commander A. S. Elwell-Sutton, R.N., B.A.

Read at the Meeting of the Society, 3 April 1922.

THIS is an account of the work done by one of H.M. gunboats on the river Tigris above Baghdad in 1918. From a geographical point of view the importance of it lies, perhaps, in the survey of the river between Samarra and Tikrit, which was carried out at the request of the G.O.C. 1st India Army Corps with a view to its navigability; but some account of our experiences generally may be of interest.

So far as has been ascertained there have been only three attempts to

To summarize, then, we have:

Lake Zwai	Fresh water.		No crocodiles.
„ Hora Abyata (marked on maps Hora Daka) ...	Salt	„	„
„ Langara	„	„	„
„ Shala	„	„	„
„ Awasa	Fresh	„	„
„ Abaya (Margherita) ...	„	„	Crocodiles.
„ Chamo	„	„	„
„ Stephanie	Salt	„	„
„ Rudolf	„	„	„

Why are some of these lakes salt and some fresh, and why are some full of crocodiles and others not?

British Consulate, Southern Abyssinia,
13 February 1922.

THE MOUNT EVEREST EXPEDITION, 1922

A RATHER long silence, while the expedition was on the march through Tibet, was most happily broken on June 9 by the news that on May 21 Mr. Mallory, Major Norton, and Mr. Somervell reached 26,800 feet without the use of oxygen; while on June 16 came another brief message, that on a date unspecified Mr. Finch and Captain Geoffrey Bruce, using oxygen, had reached 27,200 feet. Simultaneously with the first came two despatches from General Bruce, dated April 30 and May 14; with the second a very long and interesting despatch dated May 28, including a graphic account by Mr. Mallory of his climb the week before.

The rather confusing order in which these various messages have been published makes it desirable to attempt a summary of the events in order of date, with reference to the map made by Major Wheeler in his photographic survey last year, and to photographs taken on that reconnaissance. But the process of translation into "telegraphese" and subsequent retranslation in London (at high pressure for the following morning's paper) has sometimes obscured the original topographical clarity of the messages, and it is not always quite certain that the following interpretation is correct.

The expedition left Darjeeling on March 26 and 27, reaching Phari on April 6, and Kampa Dzong April 11 or 12. Here they were overtaken by Messrs. Finch and Crawford with the oxygen gear. Travelling by Tinki and Shekar, and thence due south over the Pang La to the Rongbuk valley, they were established in their main base camp by April 30, some 14 miles up the valley from Chöbuk, and apparently just

by the snout of the main glacier in the middle distance of photograph No. 14, *Journal*, October 1921, some 2 miles below the junction of the East Rongbuk valley, seen on the left in that picture. General Bruce had hoped to get the main camp higher, but the yak drivers and owners were unwilling to face the rough road along the moraine of the glacier.

About May 1 they started building stone huts for Camp I., apparently in the gap under the letters AC in the above photograph, at 17,600 feet.

On May 5 Strutt, Longstaff, Morshead, and Norton started from Camp I. to reconnoitre the way up the East Rongbuk glacier, which, it will be remembered, had never been completely traversed in 1921, though Major Wheeler had made photographic stations a long way up, on both sides of the valley. Two of his photographs are published as Nos. 10 and 11 of the series in the *Journal* for February 1922.

On May 6 they established Camp II., at heights given in different despatches as 19,360 and 19,800 feet. If the former is correct, the camp would be at Wheeler's station, which was just north of the tongue of the hanging glacier shown in photograph 10, about over the R in the last word of the title; if Camp II. is at 19,800, which from times and distances seems more likely, it would be at the foot of the steep slope in the middle of the picture, above the word "of" in the title.

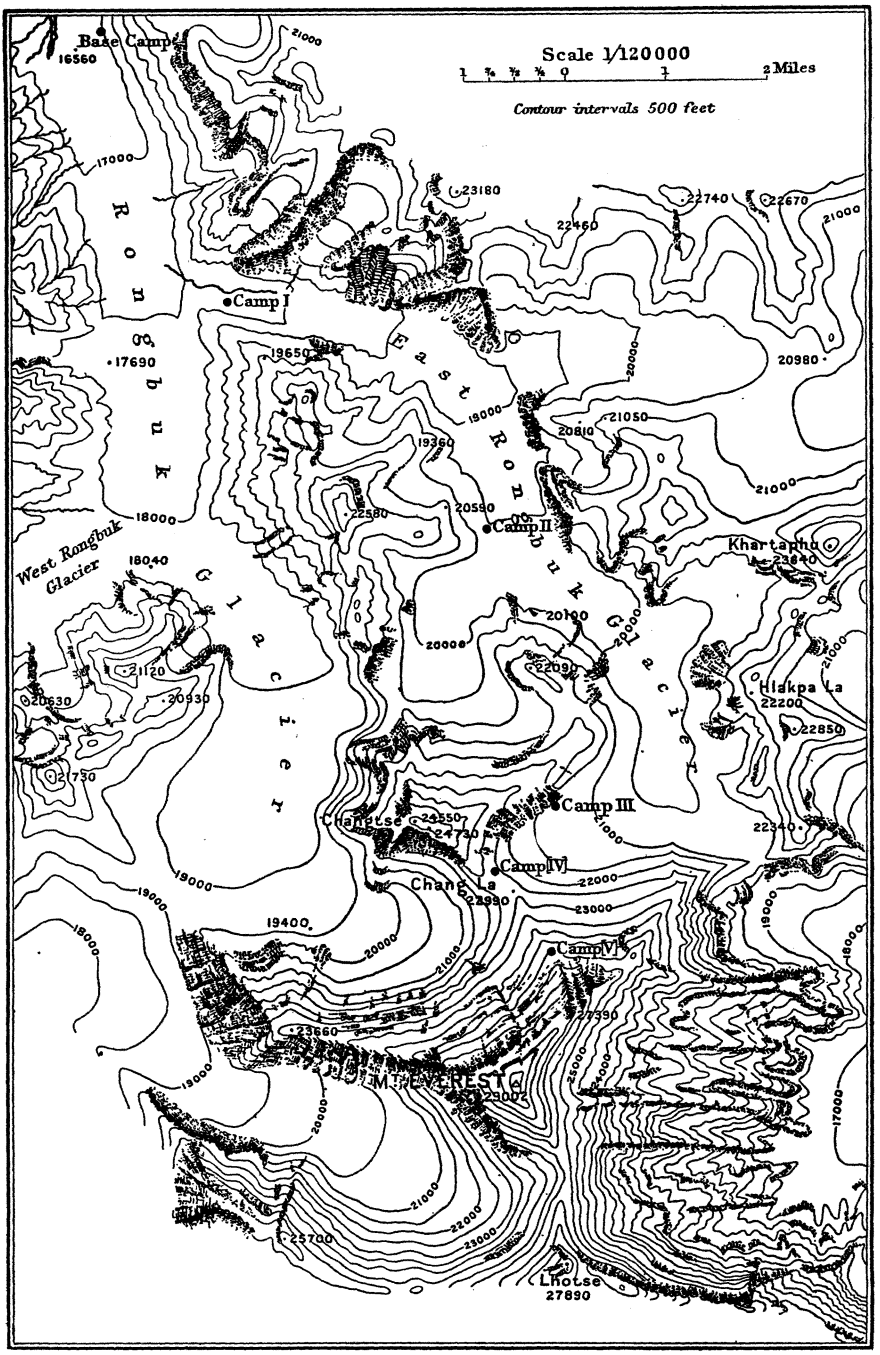
On May 7 the party had great difficulty in crossing the large side glacier shown in photographs 10 and 11, being held up by a great trench 100 feet deep, which is perhaps that shown at the bottom of photograph 11. They returned to Camp II. that night.

On May 8, making use of a way across the trench discovered by Morshead, they reached the head of the glacier under the Chang La, and established Camp III. at the foot of the steep but safe cliffs of Changtse (photograph 14, February 1922) at about 21,000 feet. If the contours on Major Wheeler's map are right, this camp would seem to be rather higher than 21,000 feet. The reconnaissance party seem to have gone down again from Camp III., to which Mallory and Somervell started on May 8 for a reconnaissance of the Chang La.

On May 13 they gained the Chang La, whose condition seems to have been much more formidable than when Mallory, Bullock, and Wheeler reached it without serious trouble in September of last year. They began a camp on a shelf just below the col, which for convenience we will call Camp [IV.], the square brackets denoting that the number is not given by the expedition reports. They then apparently went down again to Camp III.

On May 15 Strutt, Morshead, and Norton came up again to Camp III. with a large convoy of stores, and on May 17 more tents and stores were carried up to Camp [IV.].

In the judgment of Colonel Strutt, who was in command at Camp III., the time had now come for "a full-dress reconnaissance" without oxygen. On May 19, therefore, Mallory, Morshead, Norton, and Somervell, with



Outline Map of Mount Everest and its Northern Glaciers, reduced from the Photographic Survey of Major Wheeler, R.E., Survey of India, 1921.

nine porters, slept at Camp [IV.], and next day with five of the nine porters made a camp—which we will call [V.]—on the arête at 25,000 feet, the porters going back to Camp [IV.] the same afternoon, and to Camp III. next day.

On May 21, Mallory, Norton, and Somervell climbed from Camp [V.] to 26,800, not quite reaching the shoulder behind the pinnacle 27,390. Conditions were not favourable, since newly fallen snow covered the ledges and concealed loose stones, but the ground was not really difficult, and when the party turned back at 2.15 they judged that they could have gone higher, but might not then have been able to get back.

Picking up Morshead who had remained at Camp [V.] with frost-bitten hands, the party descended with much difficulty, finally reaching Camp [IV.] in the dark after 11.0, to find that the porters who went down the day before had taken all the cooking-pots. Next morning, May 22, they got back to Camp III. after a long and painful descent, suffering severely from thirst, and three of the four more or less frostbitten.

Meanwhile, Finch, Wakefield, and Captain Geoffrey Bruce had been making trial trips with the oxygen gear, and had made various adjustments, with most promising results. About May 27 or 28, Finch, G. Bruce, and one Gurkha N.C.O. spent two nights at Camp [V.] and the first two, or perhaps all three, reached 27,200 feet with oxygen.

No details of this last performance have come to hand, and we do not know if they were going all out to reach the summit, or were on another "full-dress reconnaissance." The great importance of their effort—apart from the creation of a new altitude record—is that they must, so far as one can judge, have found it possible to carry the oxygen to 25,000 feet without using any: which greatly improves the chance of ultimately gaining the summit.

The expedition of 1922 has therefore already three first-rate feats to its credit. Two different parties have camped at 25,000 feet, 400 feet higher than the Abruzzi record climb, and 1500 feet above Meade's record camp on Kamet in 1914. The first party beat the height-record by no less than 2200 feet and without oxygen; the second, with oxygen, beat the first by 400 feet.

With these initial successes realized, the possibility of a final glorious success seems to be much nearer. Theoretical considerations, as put forward by the late Dr. Kellas, showed that about 25,000 feet might be a critical point; yet Mallory is able to write of reaching nearly 27,000 feet "with little or no more physical discomfort than here at the base camp." Pressure-chamber experiments had led Prof. Dreyer to recommend that oxygen should always be used over 23,000 feet, since at that height (nominally) Somervell had shown signs of collapse in the experiments. Yet we find Somervell on the mountain triumphantly reaching 26,800 feet without oxygen, and coming down the only one of the four unfrostbitten. We find moreover that the cylinders can be carried to 25,000 feet without

using the gas on the way: and that the gas supply could be interrupted for a while, at least during the experiments on the mountain, without inconvenience or apparent risk.

One may say therefore that the first trials have shown the physiological difficulties less serious than was anticipated, and that success will depend on two factors: adequate supply at the highest camps, and the recuperation of those who have already made a great effort. Will Mallory, Norton, and Somervell be fit for another great effort after a rest at the base camp? Opinion is greatly divided; and we may be allowed to take the sanguine view that, since the physiological factor is evidently more favourable than one thought, the climbers engaged on a "full-dress reconnaissance" may, with a little nursing at the base, be fit to climb again another day.

With the keenest anticipations for its immediate future we close this brief analysis of the campaign's initial stages. The Mount Everest Committee have telegraphed their warmest congratulations to the two record-breaking parties, and to the General whose organization has made the success. Every one who follows the fortunes of the expedition—that is, a great part of the civilized world—will be anxious to hear that Mallory's frost-bitten fingers are cured, that Norton's ear has returned to its normal size, and that Morshead, who unfortunately suffered more, has at least received no permanent harm. Before this number is published what we have written will be out of date, and more records broken; but whatever happens, the elation of the first good news will remain in the memory of 1922.

REVIEWS

EUROPE

The City of London.— P. H. Ditchfield. London: S.P.C.K. 1921. Pp. vi. + 126. 4*s. net.*

THE difficulty of compression which has faced the writers of most of the volumes in this "Story of the English Towns" series probably reached its climax when Mr. Ditchfield tried to compress a vivid history of London town into a hundred and twenty small pages. As is the case elsewhere in the series, the author is more interested in mediæval than in modern life; and the history of "the 19th century and after" is condensed into one of the fourteen short chapters. It may be noted that on p. 28 Fitz-Stephen's statement that at the end of the Norman Period London provided 20,000 horsemen and 60,000 infantry is quoted as evidence of the size of the city, without comment. A total of 80,000 fighting men would indicate that the population from which it was drawn numbered not much less than half a million—an incredibly high estimate for the period, when the total population of England was little more than one million. The book contains little of directly geographical interest; but it is a useful compact summary of much of London's history, with a strong emphasis on its ecclesiastical and architectural aspects. It is also an enthusiastic pæan in praise of "the glory that is London." C. B. F.

The Geographical Journal

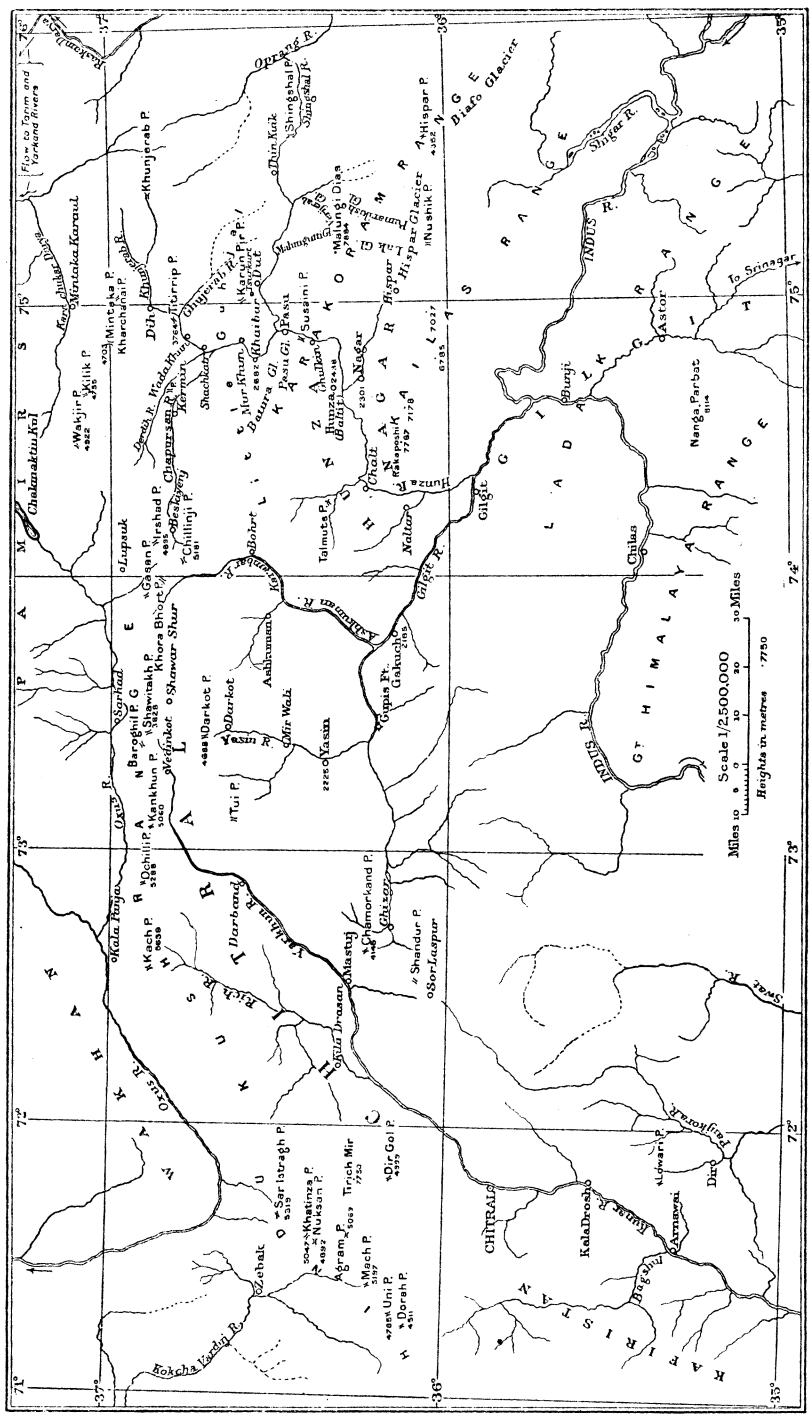
Vol. LX No. 2 August 1922

BYWAYS IN HUNZA AND NAGAR

Brigadier-General G. K. Cockerill, C.B., M.P.

Read at the Meeting of the Society, 6 February 1922.

MY purpose tó-night is to describe to you some of the lesser-known valleys of Hunza and Nagar. It is nearly thirty years since I visited them, and I should not have faced the difficult task of recording impressions formed so long ago but for two reasons. The first is that it was under our President's direction that my explorations were undertaken. Since he thinks an account of some of them might be of interest to you, it is naturally the greater pleasure to me to speak in his presence and under his presidency. The second reason that prompts me to give this lecture is that I am anxious to draw attention to the fact that there is still a large unexplored area in and about that portion of the map of Asia lying between 35° 15′ and 37° 15′ lat. N. and 71° 15′ and 75° 45′ long. E., the lines which mark the limits of my work in this region. It is here that the Himalayas, and the parallel ranges known as the Ladak, Kailas, and Karakoram, meet the Hindu Kush almost at a right angle. This sharp turn in the line of the vast mountain chain corresponds with a similar turn in the course of the river Indus. The axis of the great bend seems to lie between two points which are themselves of some geographical interest: Nanga Parbat to the south, where the great Himalaya is supposed to end; and, to the north, a point about 6 miles west of the Kilik pass, which also happens to be the apex of the pyramid formed by the basins of the Oxus, Indus, and Tarim. East of this axis, between the upper Indus and the Karakoram and parallel to them, one may distinguish a number of great troughs. They lie mainly in Hunza and Nagar and drain into the Hunza river. One of them, the Hispar Valley, is filled with the longest glacier in the world outside the Arctic regions. West of the axis, between the Indus and the Hindu Kush and parallel to the course of the Indus below its great bend, lie other troughs, not perhaps so well marked, but, as I think, practically continuous with the former. These latter valleys lie in Chitral. Most of them I have seen, but I have no time to describe them this evening. I must confine myself here to saying that it is possible to follow an almost continuous trough, that traces a bold curve extending north-west from near the Shingshal pass



Sketch-map to illustrate General Cockerill's paper on Hunza and Nagar.

in the east, where it is called Ghujerab, westwards by the Chapursan, Upper Karambar, and Upper Yarkhun valleys, and then south-west as far at least as the Ishpirin defile (Darband) and perhaps to Chitral, and even to Jelalabad. Through and across this and its parallel concentric valleys great radial fissures appear to have opened at the bend, just as the bark cracks when you bend a green sapling. One such fissure opens south from the Darkot pass. North of this pass bifurcating glaciers run north-east and north-west to Shawar Shur and Vedinkot; south of it are precipitous cliffs and gorges, through which the Yasin river flows down to join the Gilgit river. Another fissure is that through which the Karambar river drains south to the Gilgit. A third is that through which the Hunza river, in a series of stupendous gorges, bursts in succession through the Karakoram, Kailas, and Ladak ranges on its way to the Indus.

It was in the summer of 1892 that I received orders to proceed to Gilgit and to undertake the fuller exploration of the eastern Hindu Kush region. I followed the usual route by Srinagar, across the Wular lake and over the Tragbal pass to Gurais, and thence by the Burzil pass and Bunji, in the valley of the Indus, to Gilgit. This road has often been described to you, and I need say little about it. It was, at the time I speak of, just being made. I have memories of the most appalling heat in the gorge through which the Astor river cuts through to the Indus, a gorge appropriately called Shaitan Nara, or the Devil's Gap. I still see the vision of the great snow mass of Nanga Parbat rising sheer beyond the Indus. I remember, too, the kindly hospitality of the officers at Bunji. They induced me to stay and dine with them, telling me the road ahead was very simple. I crossed the Indus by a new bridge; was overtaken by a violent thunderstorm, and shortly afterwards found a line of stones apparently intended to close the path. To my right there was a precipitous descent, which proved impassable in the dark, so I turned back and tried the main road again. I had gone but a few hundred yards, when suddenly my horse again refused to move. I could see nothing but blackness. There came a flash of lightning, and I found myself standing where the half-finished road ended in space.

Arrived in Gilgit, I was at once ordered to Hunza, where I stayed for a few weeks, raising and training Hunza levies. These men afterwards did gallant work in the relief of Chitral. Then I received orders to reconnoitre the Shingshal route to Raskam and Sarikol. Our President, Captain Younghusband as he then was, had visited the Shingshal pass from the Sarikol side of the watershed, but, as he was anxious to visit the Khunjerab pass as well before proceeding to Hunza by the Mintaka, he had necessarily to turn back from the Shingshal. My orders were to proceed from Hunza up the Shingshal river to the point where he turned back, and so to complete his work. The road north from Gilgit through Hunza is really a main road from Kashmir to Kashgar. The road east and west from Gilgit to Mastuj is also of great importance. In

the long-distant past it formed the means of communication between the Tibetans and the Arabs when waging a joint campaign against China. Of these routes I had an excellent map. Colonel Lockhart's mission had passed through the country, and Colonel Woodthorpe, who accompanied it, produced a map which, checked long afterwards with the triangulation series, which was made through Hunza in 1913 in order to connect the Indian and Russian Surveys, proved perfectly accurate. It is a remarkable piece of topography. It was my task to fill in many of the gaps which, through lack of time, Colonel Woodthorpe had had to leave unsurveyed. Without his map, I should have found my task impossible.

I left Hunza on 2 November 1892. In addition to eight or ten coolies who carried my baggage, my party consisted of three sepoys of the Kashmir Regiment to which I was then attached, a Hindustani cook and a Hunza man, named Abdulla, who spoke Hindustani as well as his native tongue of Burishaski, and who understood the language spoken in Gujhal. He was a man of splendid physique, and a wonderful cragsman. About 7 miles from Hunza there is the débris of a vast landslip hundreds of feet high, which, when it fell, choked the gorge. The mass stood firm for six months. When it gave way the flood swept through Hunza, widening the ravine which separates that state from Nagar by many hundreds of feet, and bringing annihilation upon the fields and orchards. Just above this slip the Hunza river cuts through the Karakoram range. Precipices of gneiss and granite rise to an appalling height, and the river takes a sharp turn. This gorge forms the boundary between Hunza proper and Little Gujhal, or Hirbar, to give it the native name. The Hunzakuts south of the gorge are of the Burish stock, speaking the Burishaski language. The tillers of the soil are known as Birchik, but men of position among them are called Kanjutis both by the Gujhalis and the Chinese. In Yasin, too, such tillers of the soil as are of Burish stock and speak the Burishaski language are called Warshik. More attention might well be paid to this language, and to other languages spoken in this part of the world. There are some which bear a strong resemblance to the Gipsy language (Romany) if my information on this point was correct.

Proceeding north, I skirted the great Pasu glacier and camped at Pasu, where I found the son of the Mukaddam of Shingshal awaiting me with two or three Shingshalis. I asked if I could take a horse with me to Shingshal. "No!" "Could I take my dog?" I received the sinister reply that I could not take a goat by the road by which we should travel. The next morning we left Pasu and proceeded north for some 2 miles, and then turned east to enter the narrow forbidding Shingshal gorge. It is strange how every traveller who has been along the main route has expressed the wish to explore the valley beyond, but no one before, or, so far as I can learn, since, has had time even to enter the gorge. At every step it grows narrower, and the gloom deeper and deeper. After 4 miles we had to send our ponies back. Behind us the

THE SHINGSHAL GORGE

LOOKING TOWARDS HISPAR PASS FROM ABOVE SHINGSHAL RIVER

river was a deep and rapid stream, gliding silently over a stony bed. In summer the whole of the gorge is filled with a tumbling mass of yellow, mud-laden glacier water. In November the volume was less but still formidable. In front of us the cliffs of fine-grained, pale grey limestone rose precipitously to a vast height on either hand, and the space between narrowed to less than 50 yards. This was filled by a chaos of huge boulders, piled in the utmost confusion at the foot of the cliffs. The roar of the waters, as they crashed foaming from rock to rock, woke a thousand echoes in the precipices above. With this deafening din in our ears we stumbled slowly through the trackless waste. At length we came to an abrupt standstill. On the far side a buttress of rock rose to a height of about 700 feet. The torrent was absolutely impassable. The only path lay along the cliffs on the right bank. These had been ground and polished by the action of the summer floods, but some 15 feet above the point we had reached a narrow ledge could be seen leading to higher ledges. I was wondering how we could climb this when one of the guides doubled a rope and threw it over a tree branch fixed in a narrow cleft between two shoulders of rock nearly level with the ledge above. Up this rope first one and then another clambered, and loads were drawn up by the same means. Pushed from below and hauled from above I went up in much the same way. The next 50 yards we followed an ever-narrowing ledge of rock over which the cliff bent closer and closer, until forced to our knees and then compelled to wriggle like serpents, until finally we dropped feet foremost into a little rocky cup formed by a summer waterfall, and from thence on to further ledges from which at last we reached the river-bed again. In no other valley of the Hindu Kush is anything wilder or more desolate to be found. Not a gleam of sunshine reaches the bottom of the gorge; the river-bed is choked with boulders of enormous size, and two, leaning one against the other, form a cave which could shelter forty or fifty men. Here we spent the night.

For 8 miles the character of the gorge remains unchanged. Occasionally side streams flow in through clefts only 2 or 3 yards wide, riven sheer through the cliffs for 1000 feet. Then the valley opens a little, and here, at the place called Dut, which means a rope and basket bridge, the summer road into the valley comes in from the north. I shall speak of this later. Beyond Dut we had to climb a spur 2700 feet above us, and night fell before we reached the top of the ridge. We made a terrifying descent down the other side in the dark. My only bottle of whisky had been broken the previous day, and here, I remember, we lost the whole of our small store of flour as well. One of the coolies dropped the bag, and we heard it bounding from rock to rock as it fell into the dark void below. Without whisky and without bread we camped in the river-bed opposite a shrine. No native would cross the river, since it meant death within the year. Even the cliff was said to be sacred, and flood water powerless against it. Just as I was being told of this, a great bit of the

sacred cliff came tumbling down into the river, and was carried away by the impious stream!

The next day we passed round the snout of a great glacier called Malungutti. This comes down to the very edge of the river, from which it rises sheer: an ice-wall of wonderful colouring—below of deepest green, but graduating to an ethereal tone of emerald above—and surmounted by fantastic spires and pinnacles of every form and size. "Looking up the valley from which it issues one sees a great double-headed mountain, extraordinarily bold and massive, which the natives call Malungi Dias. The Malungutti glacier, as far as I could tell, does not descend from this mountain, but, rising far to the south of it, sweeps round its base. The two peaks, whose altitude can scarcely be less than 24,000 feet, are connected by a ridge, in height hardly inferior. For grandeur of form and prominence of position, there is no feature in the whole Shingshal valley more striking than this magnificent mountain." So I wrote in 1894. Some twenty years later the surveyors, who made the connecting link between the Indian and the Russian triangulations, fixed the position of this mountain, which they call Dumáta. The corrected position is within 5″ of latitude and 18″ of longitude of the position fixed by me with a cavalry sketching-board. Its height is given as 25,868 feet. It thus proves to be higher than any fixed peak either in the Hindu Kush or the Karakoram range west of K_2. It is clearly shown in the photograph taken from Tomtek, 18,600 feet, at a distance of 60 miles. My view is from the same angle, but only from 15 miles.

The Malungutti glacier has in the past filled in the whole valley and blocked the Shingshal river. The river now cuts sharply through the old moraine, and through the old bed of the lake that formed above it. Above the glacier the road is much easier. The village of Shingshal lies at a height of 10,000 feet on the left bank of the river in a crescent-shaped bay, 1500 yards long by 600 yards wide, nearly the whole of which is cultivated in terraces with barley and buckwheat. Above Shingshal the path remains easy. The summer path, which lies over four passes of about 14,000 feet, turns off to the left up the Zardigarbin stream, and about 4 miles east of Shingshal the Shingshal river swings round to the south-east; at the bend a gorge, so narrow that it is scarcely visible, comes in from the north-east. This stream is called Tang, and near its head lies the Shingshal pass. There is at first no path in the gorge, and a rough scramble up cliffs on the left bank brings one to a broad open plain, much scored with the tracks of game. From this a good view is obtained of the Shingshal valley to the south-east. The Verijerab glacier, the cause of the disastrous floods that years ago swept down the Shingshal river and destroyed much of the village, is seen at a short distance protruding from a steep ravine. It stretches nearly to the opposite bank. Beyond it a snowy peak blocks the view, but the valley seems to sweep round to south, and, somewhere near the Hispar pass, is lost amid the snows.

Crossing the plain the path gets worse. Here a single gnarled tree branch projects from a seamless cliff, here a fragile wooden staircase descends dizzily. Finally, after reaching a height of 12,000 feet, the track plunges down precipitous rocky faces to the very edge of the Tang stream. The gorge here is but 15 yards wide, a mere rift in the black rock. We scrambled over great boulders, past frozen waterfalls—the water pouring through a sheath of ice—across ice bridges, and forded the torrent fourteen times till we reached a place called Thin Kuik, which means "Hot Spring." The Shingshalis were much tickled at my being able to pronounce "Thin," which their neighbours called "Din." The temperature fell to 7° Fahr. and the night was bitterly cold. With me was the son of the Mukaddam of Shingshal, who I found was one of the party of Kanjutis who had confronted Captain Younghusband at the Darband on the far side of the Shingshal pass, when he visited the pass from the east. Taking him and Abdulla, my faithful Hunza servant, with me, I started out the next day to reach the point where Captain Younghusband turned back. We had to traverse a rotten cliff where a tree-trunk thrown across a chasm often formed the only path. Then came a very stiff climb of 1000 feet to a broad shelving plain, over which, for 2 or 3 miles, the path is so good as to almost deserve the name of a road. Here at the edge of the cliff which overlooks the right bank of a ravine was a cairn of stones, which I was assured was built by the men who had accompanied Captain Younghusband, to mark the farthest point he reached. I should have liked to go on to the actual crest, but I had orders to return by the Murkhun or Karun Pir pass, which is the only summer road into the Shingshal valley. The season was also very late. The weather, which had hitherto been bright and fine, was changing, and clouds were gathering. The first fall of snow would, I knew, close the pass, and my work would be incomplete. So, rather reluctantly, I felt it my duty to turn back. Before doing so my men built a second cairn to show that no portion of the road from Shahidulla to Hunza remained untrodden by an Englishman.

We returned immediately to Dut, which we reached on the third day, and then, turning our backs on the Shingshal river, faced the Karun pass in front of us. We had forded the river seventy times in all, in water always icy cold, often frozen top and bottom, and in a depth varying from 18 inches to nearly 5 feet. We had had enough of it. The path up to the Karun pass ascends at a terribly severe gradient for 1500 feet, through clay and gravel cliffs, overhanging schistose rocks, clearly marking the limits of an ancient lake-bed, or perhaps a pamir. Here I deciphered an inscription written in Persian on the cliff, a couplet from Saadi, cursing the difficulties of the road. We camped at a place called Tsurkurt, where there was a spring 3000 feet above the river. Next day we crossed the Karun pass. There is no gap in the ridge, and the rock is weathered into dome-shaped mounds of schist. There were 3 feet of snow on the

north side, the height being a little over 16,000 feet. There was a little glacier below, descending to which the laden coolies had to exercise care. But the snow was hard and the slope steep, and so some of us enjoyed a glissade to the bottom. Halfway down a sharp turn was necessary to avoid a rock, and one of the men, losing his balance, did the rest of the journey head-foremost, ending, amid much laughter, in a snowdrift. After a weary stretch of 3 or 4 miles through soft snow we reached a smiling little alp called Pariar, where the stream flowed through grass meadows, and the Murkhun shepherds bring their flocks to graze in summer. To eyes grown weary of the barren cliffs and gorges of Shingshal it seemed lovelier than it doubtless is. From there to the Hunza river at Murkhun the descent grows steeper and steeper, the last few miles through a very narrow gorge.

As the weather had cleared, I now decided to attempt to explore the Khunjerab valley leading to Sarikol. I took with me on this occasion a larger tent, and a table and chair, having found by experience in the Shingshal that there is nothing more trying to the temper, after a long and dreary trudge, than sprawling on one's bed while writing up a diary and making a map. Indeed, when the ink in the stand is frozen and every nibful has to be thawed in the flame of the candle, the work becomes interminable. I need not speak of the route up the Hunza river; its terrible gorges have often been described. We soon turned up the Khunjerab river, and the laden coolies followed a difficult footpath up the right bank. Being mounted I kept to the river-bed and forded the stream a dozen times or more. Even in November I found the fords none too easy; in places the water was over my saddle. Just below the confluence of the streams from the Kilik and Khunjerab passes, the river flows in a true gorge, very narrow but not very deep. Then to avoid this gorge the path crosses the Luwarchivech spur. We marched for two days up the Khunjerab valley, which rises at a very steep gradient. At Shachkatar, where I camped, the river cuts through a mountain wall and flows in a true gorge, the cliffs rising sheer to a vast height. They were "alive" that night, and times without number I was awakened by the din of falling rocks, which at first I mistook for peals of thunder. In the morning we had a chase after a little animal which appeared to have its home among the loose rocks at the foot of the cliffs. I thought at first it was a leveret, but think now that it was what I have since seen described as a "mouse-hare." It had large round eyes, a small round body with ample mouse-coloured fur, and it dodged very actively in and out among the freshly fallen rock débris.

At Wadakhun, where we camped the following night, the Khunjerab valley runs east and west. To the north the hills recede in the form of a crescent. Girt round by this half circle of hills lies an elevated alluvial plateau through which the river has threshed its way to a depth of more than

1000 feet. About a mile to the east is the confluence of the Ghujerab from the south-east. This river drains a valley which is much broader and more extensive than the valley of the Khunjerab above the confluence. Its volume of water is far greater than that of the Khunjerab, and since the Khunjerab is a larger stream than that which flows down from the Kilik it follows that at the head of the Ghujerab valley, somewhere near the Shingshal pass, lies the true source of the eastern branch of the Hunza river. During the night we spent at Wada Khun heavy snow fell, and in the morning the ground was thickly covered. At the request of the coolies I stored the greater part of my baggage in my tent, which I left standing, and proceeded on the way to the Khunjerab encumbered with as little baggage as possible. Our route lay over easy slopes, gradually ascending for about 2 miles across the eastern horn of the crescent already described. It terminated to our right in a low flat-topped knoll, beyond which the cliffs fell precipitously to the river 2000 feet below. In front of us the track crossed the spur and then plunged, at an appalling gradient, down a rocky gully and out of sight. From the spur we could trace the course of the valley for miles, and below us, like a silver thread, we could see the stream winding through narrow strips of jungle, now hidden by a projecting cliff, reappearing again straight below us, and finally vanishing in the deep gorge to the right.

This pass, called Titirrip, approximately 12,350 feet high, is held by the Guhjalis to mark the boundary. In winter one cannot get horses across the pass, or even laden men, as I soon found. In summer you cannot get them beyond the pass owing to the depth of the water in the river. On the other hand, the higher valley is easily accessible from Sarikol, and in places there are traces of Kirghiz colonization. In fact, the water-parting between the Indus and Tarim basins is not always locally accepted as the boundary. The Shingshal people regard the whole of the Shingshal Pamir as far as Darband as belonging to them, and assert their right by grazing their cattle on it. I found afterwards that the Indus–Oxus watershed is not regarded as the boundary either. Thus the Ishkumman people use the grazing grounds beyond the Khora Bohrt as far as Ab-i-Wakhan. On the other hand, the Wakhis claim and use the splendid pastures of the Upper Yarkhun valley.

When we reached the Titirrip pass we found the descent impossible. I had stayed behind on the pass to do a little plane-tabling, and, hearing considerable commotion below me, hurried down the slope to overtake the coolies. The path was at first easy, but where it became steeper I found them all huddled together, none of them anxious to follow the hasty lead of one who had slipped and fallen, but by good fortune had been brought up suddenly on the very edge of the precipice. Their leather foot-gear could get no grip on the icy slope, and after several had had very severe falls it became obvious that I must cut steps for them. There were no ice-axes; nothing, in fact, except my alpenstock and the

heel of my heavy boots. I, however, went in front. So long as the ground was not rocky I had little difficulty in cutting steps which were at least sufficient for my own wants. But by this time the coolies had lost their heads and the younger men were in tears. Nearly every one expected me to help him, and I had to help with the loads as well. When we reached the ice-covered rock surfaces, the difficulties increased. Progress was painfully slow, and after an hour's toil it became obvious that we should never reach the bottom of the slope before nightfall. The path had become really dangerous, and it seemed likely at any moment that a coolie would fall and break his neck. I therefore decided to return and to put off the further exploration of the Khunjerab valley till the spring. When, five months later, I revisited the place and viewed the whole descent from top to bottom, I saw no reason to regret this decision. Snow fell all that day and all the next. No survey work could be done, and the ill-clad and ill-shod coolies suffered severely.

I therefore returned to Hunza. The route down the river is well known. The Hunza river makes a big bend through a deep gorge at Khaibar at a level of about 8500 feet, between two peaks 4 miles apart, both about 18,000 feet high. This may be the real axis of the northern Karakoram range.

I started north again five months later. Experience taught me to replace my local coolies by carriers from Baltistan. These men I equipped as well as I was able, and they remained with me for two months and did extremely well. During the winter, too, thanks to our President, my stock of surveying instruments had been largely augmented. Besides my cavalry sketching-board and an aneroid, which were all I had in Shingshal, I now had a 3-inch mountain theodolite, a 6-inch sextant, a subtense instrument with a 10-foot rod, and two hypsometers. Colonel Woodthorpe had used the subtense instrument with Lockhart's mission of 1885–1886. He generally worked the traverse himself, and entrusted the plane-tabling to a native surveyor. To the latter he gave the bearings and distances obtained, and in this way they did as much as 19 miles of a good route traverse in one day. On the other hand I had no one to help me, and I had no tables by which to find the distances. I had to calculate each distance from formulæ. I then plotted them on a large scale and reduced them, replotting them on the plane-table, and then worked in the topography. In the Khunjerab the gorges are so narrow and so tortuous that I had to observe at very frequent intervals. I took the mean of three to five observations of each distance, and all this consumed a vast amount of time. Working ten and eleven hours a day I never did more than 12½ miles, and averaged not more than 8 or 9. So far as my work has been checked by the trigonometrical triangulation conducted up the Hunza valley, it appears to have been more accurate than I could have hoped. Occasionally I got a bearing to fixed peaks, which, with very careful observations for latitude, helped me greatly.

My party, beside the Balti coolies, my Hindustani cook, Abdulla, and myself, consisted of a Pathan orderly, another Hunza man to carry the 10-foot rod, and a guide. We reached the Titirrip pass again on April 26 The descent was at first easy, but presently the path plunged abruptly down a rocky gully for some 1200 feet, and then down broken detritus slopes steeply to the river-bed. The total descent proved to be 1950 feet in 1300 yards, or exactly 1 in 2. Beyond this pass the path lies in a gorge. At Dih a considerable tributary flows in from the north-west, a fine open valley wooded with willow and a kind of poplar. It is a favourite haunt of ibex, and the stream abounds with fish, which we found very excellent. A little above Dih the Karchenai gorge enters from the north, over which there are glacier paths to the Tagdumbash Pamir. The valley narrows again until Barakhun is reached, where the valley bifurcates, one stream coming from snowy peaks to the north-east and the other coming in from the south-east.

Up this lies the path to Khunjerab. It presents no difficulties, but about 4 miles from the pass it rises sharply, leaving the valley, where the stream can be seen rising in glaciers to the south-east, and crosses some very tiresome stony slopes until it emerges upon a broad upland. The descent on the Sarikol side appeared equally gentle and easy, but a range of mountains almost parallel to the range on which we stood quickly closes the view to the east. As we turned back the snow began to fall and continued throughout the day.

During the next month I visited the Mintaka and Kilik passes. They are both well known and need no description from me. I may mention that the Hunza people call the Mintaka Kirisht. Mintaka means "many sheep," and Kirisht means "a sheepskin." I saw plenty of *Ovis poli* and some ibex with very fine heads, but had no luck with them; their womenfolk were too watchful. There were the tracks of a bear and of a wolf crossing the pass, apparently in company. Pigeon and hares were seen at the foot of the pass, and a red-breasted bird, about the size of a thrush, on the very summit.

South-west of the Kilik pass there is a fine snow peak which lies about 6 miles due south of the actual water-parting of the Oxus, Indus, and Tarim basins. I observe that, in the Indian Survey 4-inch map of Hunza published in 1915, the range on which this point is situated, and which is crossed by the Kilik, Mintaka, and Khunjerab passes, is called the Sarikol. If this is the last word in mountain nomenclature, I would suggest that the range crossed by the Irshad pass, and forming the water-parting between the Oxus and Hunza rivers, should be regarded as part of the Hindu Kush.

My next work was to visit the Irshad pass. Leaving the Kilik valley I entered the Derdih valley, and thence crossing the Kermin pass (13,050 feet) dropped down into the Chapursan valley. No Englishman had

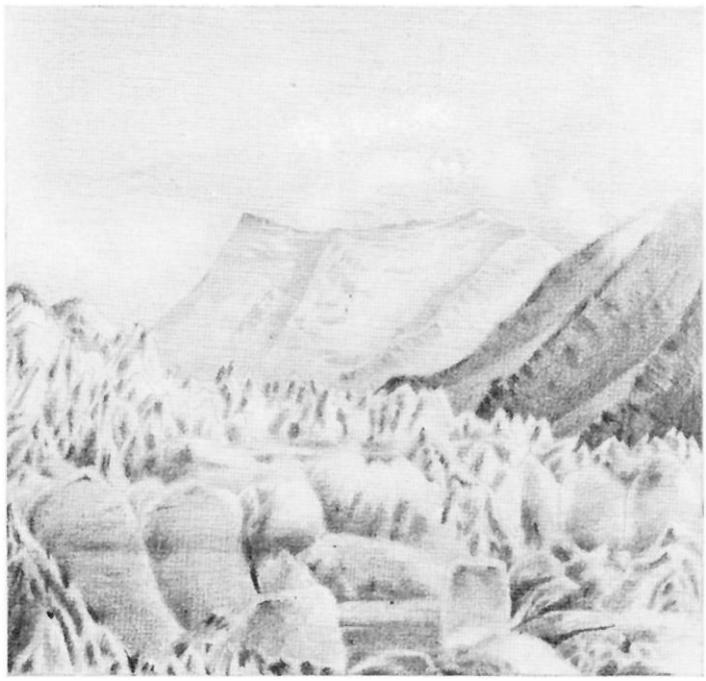
followed this route, though Colonel Grombchevski entered Hunza by it in 1888. The Derdih valley is far more extensive than had been previously shown on any map. The Chapursan valley had not been seen or mapped west of the Kermin pass. But since my time it has been crossed by Sir Aurel Stein, and I believe he has described it here. The bed of the valley must once have had the character of a pamir, and, if I am not mistaken, there are traces of alluvium on both banks at very high levels.

At its head lies the difficult Chillinji pass, by which the Karumbar valley can be reached. The actual point of crossing seems to differ in different seasons. The natives truss themselves with long poles, one under each arm, and one over the back and chest, and so trussed laugh at the crevasses. The Mir of Hunza told me that he once crossed the pass without ropes or any of the usual precautions. "How did you do it?" I asked him. "It was very simple," he said; "I put a man in front, and, where he did not fall in, I followed." More than one life has been lost on this road, which only saves one march and is seldom used. It is a curious characteristic of the lateral valleys which join the upper Chapursan valley that they descend gently until they overlook the main valley, and then fall very abruptly to the lower level. It is as if they had lost their way and had come out 1000 feet higher than they had intended. The main valley seems to have eroded very much more rapidly than its tributaries.

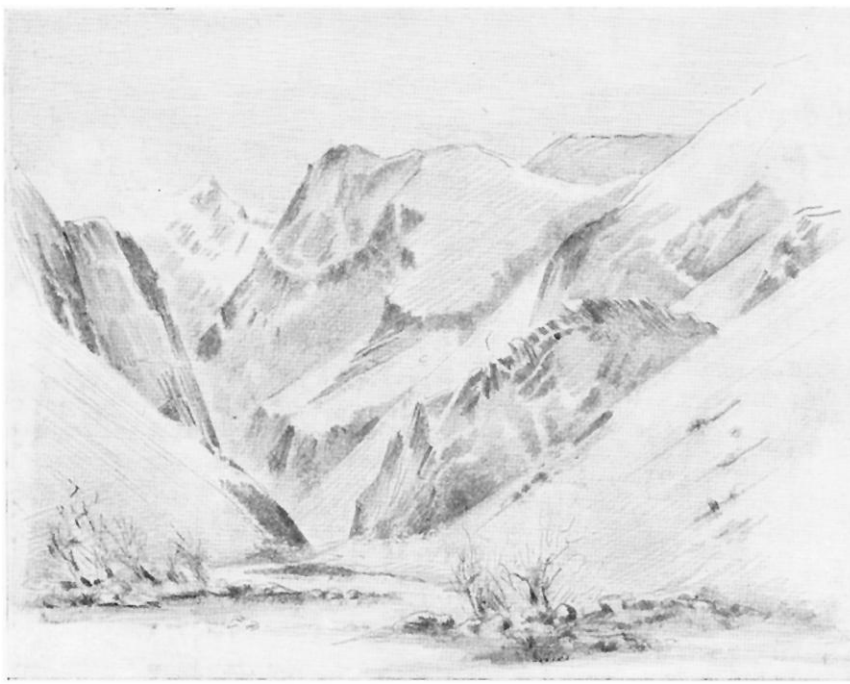
The Irshad pass, or rather passes, for there are two of them, lie at the head of a side valley about 6 miles long which joins the Chapursan river at Beskiyenj opposite a great glacier that comes in from the south. I had a horrible time getting to the pass, as there were 3 feet of snow frozen on the top but not hard enough to bear my weight. The hillsides had been swept by occasional avalanches, which we welcomed, as they cleared the snow for us. We found 3 feet of soft snow very tiring at an elevation of 16,000 feet, and took turns in leading. Eventually we cut through the overhanging cornice and reached the summit. From the pass one looks down a narrow rock-bound valley which can be traced for some 10 miles as far as Lupsuk, where the Khora Bohrt pass joins in. Facing the south-east one gets a magnificent view of the peaks, nearly 23,000 feet in height, which separate the higher snowfields of the Batur glacier from those of another glacier which trends west. These glaciers have never been explored, but I believe that that visible from the Irshad pass is the main source of the Bar glacier which drains into the Hunza river near Chalt.

Returning from Irshad I saw a magnificent avalanche fall into the valley behind us, taking its start from a very lofty peak on our right and falling right across the path which we had just traversed. This was the only one I saw or heard, but the route is reputed to be very dangerous owing to avalanches.

In returning to Hunza I crossed the great Batura glacier, which we



MALUNGI DIAS AND MALUNGUTTI GLACIER



TITIRRIP KOTAL, KHUNJERAB

LOOKING S.E. FROM GHARAJAR, VERIJERAB GLACIER

found fairly easy and practicable for laden animals. I also crossed the Sasaini glacier. Whether we missed the right track I cannot say, but we were suddenly confronted by a series of profound crevasses, the ice being heaped up and contorted into the most extraordinary forms. It was no easy matter, in a gale of wind, to clamber along knife-like ice-ridges over yawning chasms. It took us an hour to reach the very pretty village of Ghulkin. The next day I crossed the Baskuchi pass. It is an upper road, crossing a spur in order to avoid the gorge at the great elbow of the Hunza river. It is a horrible path, very steep to the top of a dry gully, and then an awful precipice, a sheer wall of rock down and across which a narrow cornice, scarcely more than 12 inches wide, has been bracketed to the face of the cliff with really marvellous skill. Two turns in the perilous gallery makes the passage hazardous for animals. The river-bed, though 2500 feet below, seems, as one stands on the cornice, to lie beneath one's feet. I could never have believed it possible to take a pony across it, had I not been told by the Mir of Hunza's brother that he brought his own across it not ten days before, and had I not seen the marks of hoofs along the track.

Towards the end of that year, 1893, I made many minor explorations of which I have no time to speak. Among others I explored the Daintar valley, at the head of which there is a V-shaped depression, filled with ice and heavily corniced. Lieut. (now Field-Marshal Sir William) Robertson, who had visited it, reported it to be impassable. I confess that I did not like the look of it myself, the rock wall at the end appearing very steep and formidable. When I asked my guides if they had ever crossed it they replied, "God forbid." But our President made light of it when he made up his mind one day to see where it led. I myself found a pass, which had not been crossed before, leading south over a spur which may prove to be a continuation of the Kailas range. It lies between the Daintar and Naltar valleys. The elevation of the pass is 15,210 feet, and there are glaciers on both sides. The rock dips almost vertically to the south, so that the top of the ridge scarcely affords room for a plane-table. Crossing into the Naltar valley I found myself in the most exquisite highland scenery.

Another time I had the pleasure of climbing a steep valley in Hunza, in the company of Charles Bruce, who is leading the expedition to Mount Everest, which we all hope will prove successful. We spent a night at the head of the valley, and from our camp looked right up the great Hispar glacier. Bruce cooked a wonderful dinner for us both, and the next morning gave me an ice-axe and a rope, and my first lesson in using them. I well remember being let down a steep rock face with one end of the rope about me and turning like a joint on a spit in a vain endeavour to get a foothold as I descended. When I reached the glacier Bruce threw me the rope and in half a minute stood beside me. How

he did it I do not know to this day. I may mention that I spent the whole of 1894 in exploring the Hindu Kush and the lateral valleys of Chitral. In the course of my work I discovered and crossed a score of glacier passes, but feared to use the rope, and my steps were not always very well cut. For example, there is a pass called Dir Gol which crosses a range just south of Tirich Mir. The pass is over 16,000 feet high. It is a fissure in a razor-like splintered ridge of porphyritic granite, which here forms the watershed. The descent lies down an almost perpendicular couloir, over rotten rocks, for 100 feet or more, and then for another 60 feet down a steep ice slope. As we crossed this, one of my amateurish ice-steps gave way beneath my Ghurka orderly, who, followed by my dog, went flying downwards. At the foot of the slope there yawned a great crevasse, but he struck it where it happened to be crossed by an ice-bridge, and swung right out on to the glacier.

As might be expected, earthquakes in this part of the world are frequent and severe. One perhaps deserves more particular mention. I was waiting for a missing pony, and was standing on a small stretch of level ground across which the path ran before entering a narrow gorge beyond. Suddenly I saw the steep mountain slopes on both sides of the gorge grow "alive" (as it is called), and huge masses of rock fell crashing into the valley, wholly obliterating the path, as I subsequently discovered. Great clouds of dust rose high into the air, and as I watched, astonished at the sight, from out of the gorge appeared as it were a succession of billows, like great Atlantic rollers after a storm. In another moment they were upon us; the earth heaved and rocked, and among men and animals all was temporary confusion. I remember it gave me a queer sensation such as one gets on a swing or an anchored boat. There were not, I think, more than a few waves, at most a dozen, and I could form no accurate estimate of their height from ridge to furrow.

Before leaving Hunza and Nagar I wished to see every village in Nagar, as well as Hunza, to complete my work. Crossing to Nagar, which is very prettily placed on a ridge beside a lake, I camped at Hupar, and reached Hispar the next day, crossing the Bapur glacier and the Rashtanni pass. The Hispar river is crossed twice by very frail bridges. Just above the Hispar village lies the snout of the Hispar glacier, which, as you all know, unites with the Biafo glacier to make the longest ice pass in the world outside the Arctic regions. The map of the Hispar–Shingshal watershed is still far from complete; indeed I doubt its accuracy. It is certain that about 6 miles above Hispar a great glacier, called Lak, joins the Hispar glacier from the north, but there is considerable doubt as to the proper position of Hispar. Surveyors with the Bullock-Workman Expedition place it 6 or 7 miles to the west of the position found by me (36° 9′ lat. N., 75° 4′ long. E.).

Sir Martin Conway places it between the two positions. I may state

that I surveyed the route between Nagar and Hispar in exactly the same manner as elsewhere, and I made Hispar 20 miles as the crow flies south-east of Nagar. The Mir of Hunza calls it 29 miles by the track, and my route traverse made it about the same. The Bullock-Workman surveyors experienced great difficulty in identifying the two survey peaks, Kanjut No. 1 (25,460 feet) and Kanjut No. 2 (24,580 feet), and throw doubts on Godwin-Austen's map work. But Godwin-Austen's work ends a little to the west of Nushik La. He mentions that his view north was obscured by the high ridge between the Haigatum and Hispar glaciers. This is undoubtedly the fact. A close comparison of Godwin-Austen's map with those of Sir Martin Conway and the Bullock-Workman surveyors (which differ a good deal in detail) convinces me that, so far as Godwin-Austen could see, he mapped this region with his usual care and accuracy. If the Workman surveyors were, as I think, 6 or 7 miles out in longitude, they would naturally experience difficulty in identifying the fixed peaks. Hunza peak No. 2 is clearly at the *head* of the Pumarikish glacier, and the Lak glacier lies to the west of it; but how far west should it be placed, and how far north does it go? Looking at the photographs taken by the Bullock-Workman surveyors, I seem to see in the shape of the mountain mass that closes the Lak glacier towards the north-east a very strong resemblance to the great double-headed peak, Malungi Dias, which I discovered and whose position I fixed in the Shingshal valley. That peak cannot be more than 12 miles from the trough of the Hispar glacier. Godwin-Austen stated that some of these glaciers seem to run back 10 or 12 miles, and in this part of the world a glacier of 12 miles in length can only be described as one of moderate size. I am inclined, therefore, to believe that Malungi Dias drains south-west into the Lak glacier, and is thus on the main Hispar–Shingshal watershed. Probably the head of the Malungutti glacier lies near the peak Kanjut No. 1 (25,460 feet).

The whole region north of the Hispar pass is of great interest. The head of the Shingshal valley is unsurveyed, as also is the head of the Ghujerab valley. South and south-east of the Shingshal there is a wide area which may contain high mountains still uncharted. In this direction, too, there is reputed to be a pass leading from a point east of the Shingshal pass up a tributary of the Oprang valley into Baltistan. I think the great Hispar glacier has proved too strong a lure to travellers in this part of the world. It has diverted attention from mountains and valleys in the vicinity that deserve to be more thoroughly explored. I shall feel deeply gratified if my lecture to-night induces some competent person to undertake an expedition to the north of the Hispar. I am convinced that there lies in that direction a field for exploration worthy of any traveller, however distinguished.

Before the paper the PRESIDENT said: I have great pleasure in introducing to you Brigadier-General Cockerill, who years ago was with General

Bruce and others here to-night serving on the Kashmir frontier, which is so well described in Mr. Knight's book 'Where Three Empires meet.' When the Russians were advancing towards our frontier, General Cockerill made most interesting journeys into that still relatively unknown country and discovered a very high mountain which apparently nobody has visited since, though its height has been fixed by the Survey of India from a distance. I will ask General Cockerill to give us his paper on these journeys.

General Cockerill then read the paper printed above, and a discussion followed.

Sir HENRY MCMAHON: I can add very little to what has already been said, but as you have asked me to speak I welcome the opportunity to pay my tribute of thanks to General Cockerill for the most delightful and interesting paper we have had from him this evening. It has been a great pleasure to me personally, for I was in civil charge of that country for some years, and these pictures have recalled many familiar scenes and faces. I was helped a very great deal in finding my way about the less-known portions of that country by the very able and valuable reports which General Cockerill had written and left behind. I would like to endorse what has been said by General Cockerill to-night, that more men ought to visit and work in this country and fill the many unexplored and unsurveyed portions that still remain. The beauty and grandeur of the scenery, and the friendliness and charm of the people who inhabit this remote corner of the Earth, will amply reward them for their efforts.

The PRESIDENT: I should like to see, as a result of this evening's paper and discussion, parties sent up to complete the work commenced thirty years ago and bring us back thoroughly good maps and still better photographs. It is a most wonderful region, and even if travellers cannot go out from England, I hope that officers will go from Gilgit and carry on General Cockerill's work of thirty years ago. I know you all wish me to thank General Cockerill for his interesting lecture this evening.

THE KLAGENFURT PLEBISCITE

Roland L'Estrange Bryce

Read at the Meeting of the Society 8 *May*, 1922.

I MUCH appreciate the honour which your Society has paid me in inviting me, as Secretary-General of the Klagenfurt Plebiscite Commission, to give you some account, under the heading of Political Geography, of one of the many "children" of the Peace Conference. This account I shall more or less strictly confine to a description of the organization and methods with which the Plebiscite was conducted. The geography of the plebiscite area is simple and does not call for any detailed description, and, as events shaped, the purely technical geography of the plebiscite, as distinct from its political side, is comparatively unimportant; but this might not at all have been the case had Zone 1 of the Plebiscite area voted for Yugoslavia and Zone 2 for Austria, which would in all probability have necessitated certain geographical adjustments of the Line of Demarcation between the two zones, to include the

open ground comes along like a wall of red-hot rock 30 or 40 feet high, which keeps falling away in front as it advances ; but when it came down the deep ravine between Wernerfelde and Retzlaffelde it flowed like a red-hot river at the rate of about 2 feet a minute. Since the outbreak of the volcano we have not experienced any severe earthquakes, though we frequently feel the house shaking. I have been round the edge of the lava where it runs into the sea. I could not approach nearer than about 300 yards on account of the heat. At that distance the sea was so hot that you could not put your hand into it. Many dead fish were observed."

From the large-scale plans attached to Mr. Reading's reports the accompanying sketch has been made to show the progress of the lava-streams. The material damage to March 22 comprised the destruction of about 160 acres of plantation, with two native compounds, and the interruption of the main road and the plantation railway. Its long duration makes this eruption of particular interest, and we shall look forward to receiving later news.

THE MOUNT EVEREST EXPEDITION

THE high hope in which we ended our account last month has been dispelled by fuller news of the second climb, and by a grave accident that befel the third attempt, with the loss of seven of the splendid porter corps to which so much of this year's success has been due. This disaster—the most serious that has ever befallen a British mountain party —happened on June 7, but the news did not reach England until July 15, only one day before the arrival home of Captain Finch, who had actually started up the line of camps with the party on June 3, but had been obliged after the first day to admit that he had not recovered from his immense exertion of the week before, and came back just in time to join the first homeward party conveying Major Morshead to Darjeeling. A brief summary of the cabled news can now be amplified from the report of Colonel Strutt, Dr. Longstaff, and Captain Finch to the Mount Everest Committee at their meeting on July 17.

When the oxygen gear was assembled at Camp III about May 20 it had suffered from the accidents of travel, but more from the unexpected effects of the dry Tibetan climate on asbestos washers. By hard and skilled work Captain Finch was able to repair much of the damage, so that on May 25 he, with Captain Geoffrey Bruce, a Gurkha N.C.O. Tejbir, and nine porters, started from Camp IV and made a camp VI about 500 feet higher than Mallory's Camp V, but on the northern arête, whereas Camp V had been driven east of the arête by the wind. At Camp VI the party were stormbound for the night of the 26th and the whole following day. On the second night they were able to sleep fitfully by inhaling a quarter ration of oxygen, and the following morning the three started upwards, Tejbir, who was also using oxygen, carrying the great

load of six cylinders, the others four. At 26,000 feet the gallant Gurkha fell out, while Finch and Geoffrey Bruce, finding the arête too windy, struck across the northern face to a point on the summit ridge halfway between the pinnacle 27,390 at the shoulder and the summit. Just below this ridge an accident to Bruce's oxygen apparatus was remedied by Finch's resource in the most awkward conditions; but they had reached the limit of their powers, for an unexpected disadvantage of oxygen appeared: they could not carry enough food to satisfy the hunger it induced. About 30 feet of step-cutting and a short rock pitch would have taken them on to the ridge; but they could see just ahead a cliff of 50 feet which would have required a long détour, and just below the summit a much more serious impediment in a hanging glacier and steep rocks which would have been formidable on a Swiss mountain. They were therefore obliged to retreat; and picking up Tejbir at Camp VI they made the tremendous descent to Camp III that same evening, arriving utterly exhausted and all slightly frost-bitten.

General Bruce's long cablegram embodying Finch's story of this exploit was dated June 2, and a third attempt was already preparing. Morshead, seriously frost-bitten; Norton, who had spent his last ounce of strength in helping Morshead down on May 22; and Geoffrey Bruce, with frost-bitten feet, were all out of action; but Somervell had completely recovered, and Mallory and Finch were ready to go with him on a third attempt, with Wakefield and Crawford in support. They started up the line of East Rongbuk Glacier camps on June 3, but the same evening the breaking monsoon started a snowstorm lasting thirty-six hours. Finch reached Camp I, and was then obliged to give up and return. The others got to Camp III on June 5, rested a day in glorious sunshine on June 6, and the following morning started for the Chang La. On the lower slopes the snow seemed sound, and they were halfway up when the whole party of three climbers, Mallory, Somervell, and Crawford, with fourteen porters, on four ropes in all, were swept down by a sudden slip of the snow, which carried two of the porter sections over a small ice-cliff into a deep crevasse. Two were dug out alive, and after great exertion six bodies were recovered, but a seventh man could not be found.

So the third and last possible attempt of the 1922 expedition ended in disaster, which narrowly escaped being more than twice as great. The glacier camps were to be evacuated at once, and the last of the party hoped to be clear of the windy dreary Rongbuk valley by the middle of the month of June. "After six weeks of this infernal camp I deserve a half-holiday," wrote General Bruce in his last letter, proposing to go down to the Kharta valley for a while before returning to India, where he is due about the middle of August. Norton, Geoffrey Bruce, and Tejbir had already left for Kharta on June 5, travelling with Strutt, Longstaff, Morshead, and Finch, who were taking Morshead down for hospital treatment,

in grave anxiety whether it would not be necessary to operate on the way. This was happily averted, and a troublesome foot was saved; but it is feared that Morshead will lose the top joints of three fingers of the right hand, and all his many friends will sympathize with him in the unhappy result of his stout efforts on the mountain. Colonel Strutt, Dr. Longstaff, and Captain Finch have returned professing good health and complete recovery on the voyage home, and have made a very valuable report to the Committee.

From their account the Committee have concluded that the difficulties and hardships of the Expedition have—very properly—been understated in the cabled reports from General Bruce, and that the published accounts do not give any idea of how formidable the mountain really is. The last 1700 feet are difficult and ascent impossible unless there are four consecutive fine days. The work of the porters was beyond all praise, and the fact that all but one old soldier of 40 were young men about 22 supports the conclusion drawn from the climbers, that youth is a principal requirement. This year all the climbers went near the limit of exertion, and some overstepped it. Only one man recovered at all quickly and in a few days seemed none the worse after the high climb. The use of oxygen improved the rate of ascending, and even more of the descent; but the after exhaustion seems to have been greater, and the arguments for and against its use will be protracted.

The Tibetan authorities and the Chief Lamas of the monasteries were in every way friendly and helpful, and much appreciated the party's scrupulous observance of the undertaking not to shoot. The sanctity of the Rongbuk valley made it in some ways inconvenient for a base camp: for example, no sheep might be killed for food within 20 miles of camp; and the valley was, as we knew before, quite destitute of supplies: a cold and gloomy corridor with a furious wind always blowing. The idea brought back last year that the ante-monsoon season would provide the necessary fine weather was much too sanguine; but there has been no tendency this year to extol the probable superiority of the post-monsoon. The truth is probably that the weather about Mount Everest is nearly always wild, and the greatest obstacle on a mountain already difficult enough. The "easy snow slopes" gave way last year to rock that looked as if it might be bedded favourably, and proved on trial this year to be quite the reverse. The difficulties of the summit ridge have been described above. Last year the East Rongbuk glacier, very imperfectly reconnoitred, appeared to offer a simple way to the eastern face of the Chang La. This year it provided on acquaintance a very arduous route, and we should not be surprised to learn that the main glacier and the western face of the col are not more difficult, and a good deal more direct: until perhaps they are tried on a third expedition.

Last year's expedition was tentative and prolonged, in its way leisurely. This year's has been short and severe, and the last members of the

expedition will have left the Rongbuk valley less than twelve months after it was first entered by Mallory and Bullock in 1921. The Committee had proposed that full use should be made of the whole summer, and were prepared if necessary to send out reinforcements for a post-monsoon campaign; but the general exhaustion of the whole party within six weeks of establishing the base camp has made this out of the question. That is one of the grave disadvantages of the Rongbuk side: there is no agreeable rest-camp, as at Kharta, to which worn-out men may go down and recuperate.

Sooner than was expected, then, we may begin to sum up the results of 1922:—the establishment of the whole force in position with full equipment at the earliest possible date; all records broken, and 26,800 feet reached on May 21 without oxygen; records broken again a week later and 27,300 feet reached with oxygen; a gallant third attempt, if in the circumstances a forlorn hope, defeated ten days later by fresh heavy snow and consequent disaster: a greater achievement than to many seemed possible, yet falling short of the goal by 1700 feet. The Mount Everest Committee have lost no time at either stage in conveying to the leader and his staff their high appreciation of the triumphs won, and at the end they have had the sorrowful duty of asking General Bruce to see that suitable provision is made for the families of the gallant porters who had served so nobly and fallen in the last assault.

REVIEWS

EUROPE

The Rainfall of the British Isles.— M. de Carle S. Salter, Superintendent of British Rainfall Organization (Meteorological Office). London: University of London Press. 1921. Size 7½ × 5. Pp. 295. *Illustrations and Maps.*

THIS volume is a condensed and much-needed summary of the extensive knowledge of the regional and seasonal distribution of rainfall which has been gleaned since the foundations of the survey were laid by the late Mr. G. J. Symons in the 'sixties. It is no mere uninspired compilation of statistics, and Mr. Salter may be congratulated on having produced a thoroughly readable book which makes some attempt, on the whole successful, to account for the interesting facts disclosed. The definite double oscillation in the seasonal distribution such that, relatively to the annual average of the respective districts, the western part of the kingdom is wet in winter, the eastern part in summer, whilst spring is everywhere dry, and autumn everywhere wet, is discussed at some length but only partially explained. Mr. Salter classifies the types of rainfall which prevail in these islands in three main categories, viz. "cyclonic," "convectional," and "orographic." This is undoubtedly a convenient division, but, as he himself indicates, there are no hard and fast lines between these types. One suspects, indeed, that if the microscope were applied to the circulation associated with many of the so-called local convectional or thunder rains at least the rudiments of a cyclonic structure would

THROUGH WESTERN YUNNAN

F. Kingdon Ward

Map following page 240.

DURING the last twenty-five years the main east and west road across Yunnan from Bhamo to the capital has been traversed to and fro by so many Europeans, that the theme, as a traveller's tale, is well-nigh exhausted. But apart from this, and one or two northern roads, there are many corners of the province, especially bordering on Tonking and the Shan States, as well as in the north, which are yet scarcely known. A journey from Lashio, the terminus of the Northern Shan States Railway in British Burma, to Muli over the Szechwan border took me through some of the less-known parts of Yunnan, and it is of an unfamiliar route that I write.

I left Lashio on April 11, travelling north-eastwards to the Salween. Much of the country here consists of rolling grassland plateaux, only the streams being fringed with forest. Everywhere the rock is limestone, giving rise to a rust-red soil, and to typical scenery. One remarkable result is the formation of sinter terraces in the streams. In the upper reaches of the Nam Yao, for example, there are scores of these natural weirs, each terrace ending in a ledge over which the water pours; a deep pool forms below, and shoals gradually to the next terrace. Each ledge has a wavy outline, and hollow tongues project downstream. The ledges tend to work upstream as the lip is worn away, and more sinter is deposited in the shallows behind. As to the origin of the terraces, the heat of the sun would no doubt precipitate lime in solution; but they are especially formed under trees where the water is coldest. Hence it is not improbable that acids derived from decaying vegetation play a more important part in their formation. One stream, overshadowed by magnificent horse-chestnut trees then in full bloom, was a network of terraces, ledges, and crimped basins.

At the village of Möngyaw, three stages from Lashio, a disused stretch of cobbled road is seen. This is clearly of Chinese origin, and was probably in use at the time when the Chinese worked the silver-mines in the Shan States. It is interesting to observe that on their side of the frontier the Chinese are again actively engaged in making a good road in this direction. Just beyond this village the Nam Yao disappears underground amidst a wilderness of sinter boulders, which at this season are carpeted with the graceful little *Primula Forbesii*.

From Möngyaw we proceeded up a broad grassy valley, flanked by the towering Salween divide on our right; then crossing a low pass we descended into the basin of that river. The country is sparsely populated, with small Shan villages below, Maru villages above. This poverty is no doubt largely due to the limestone formation, which weathers to a

stiff clayey soil difficult to work. The underground drainage also is inimical to cultivation, and the hills, though well wooded, are steep and frequently broken by scarps.

The descent to the Salween from the crest of the divide is not less steep than it is on the Bhamo route, 100 miles further north. The Salween is here a mighty stream, flowing swiftly between high sandy banks covered with jungle. Several ferry boats ply to and fro during the open season. Mules are conveyed across in a big barge, while passengers and loads are paddled over on a raft, consisting of two canoes lashed together and decked in. A glutinous heat pervaded the valley, but daily rain-storms, accompanied by lightning and strong gusts of wind, swooped out of a clear sky and cooled the atmosphere.

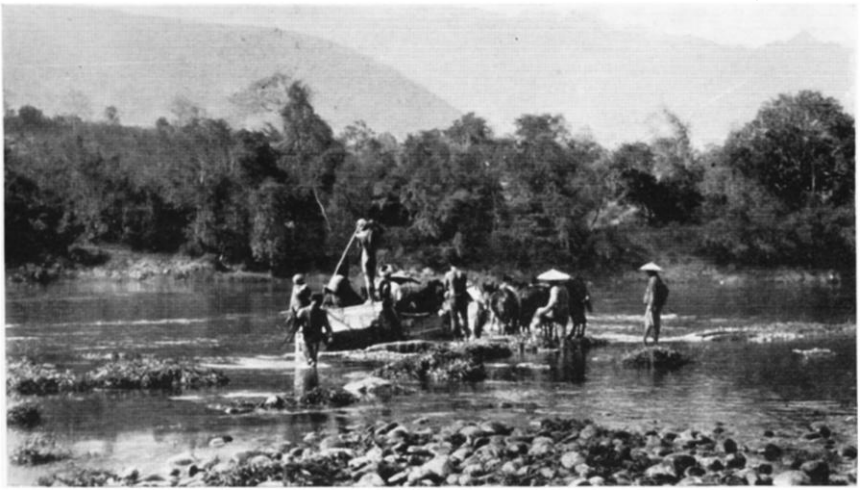
After leaving Kunlong, a small village on the left bank, we marched up the valley of the Nam Ting. *Nam*, by the way, means "river." On the second day after leaving the ferry we crossed the Chinese frontier, and fording a stream from the north emerged on to a plain covered with high grass, evidently a swamp during the rains.

We had scarcely started next morning when we were overtaken by a Chinese merchant returning from Lashio to his home in Shunning. Invited to join his caravan, we gladly did so, as the road was said to be infested with brigands, and his party were well armed; indeed, every caravan went armed. Our friend led us by a direct road to Shunning, instead of crossing to the left bank of the river and following it up to Lünchow (Yunchow), as we should otherwise have done. At mid-day therefore we left the river and entered the mountains to the north.

For the next two days we travelled parallel to the Nam Ting valley behind a range of limestone peaks, well wooded on our side, but steep and bare towards the south. When one reflects what a vast area of Yunnan is composed of limestone ranges, uplifted from 10,000 to 20,000 feet above sea-level, and further, that this rock must all have been laid down in a moderately deep sea, one begins to realize what tremendous forces have been at work in this country. Nor is that all. The limestone is frequently interstratified with belts of slate and schist, originally deposited in shallow water, indicating an alternation of upheaval and subsidence.

The country was still thinly populated, the villages poor; but the valley we were ascending was well cultivated, and astonishing quantities of opium poppy were hidden away in the remoter nooks.

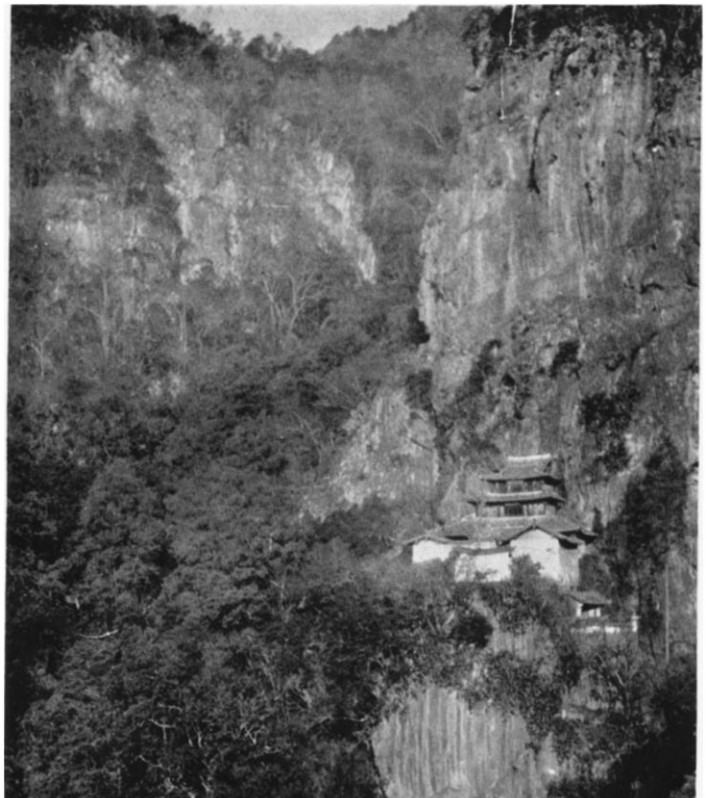
Crossing a pass at about 6000 feet we turned more to the north, and descended into a fairly big valley dotted with villages. Here the vegetation underwent a marked change, monsoon forest giving place to a more Chinese type, in which pines and scrub oak predominated. Though not yet out of the Salween basin, clearly we were approaching the dividing line between the Indo-Malayan and Chinese floras, which corresponds roughly with the range separating the Mekong and Salween basins.



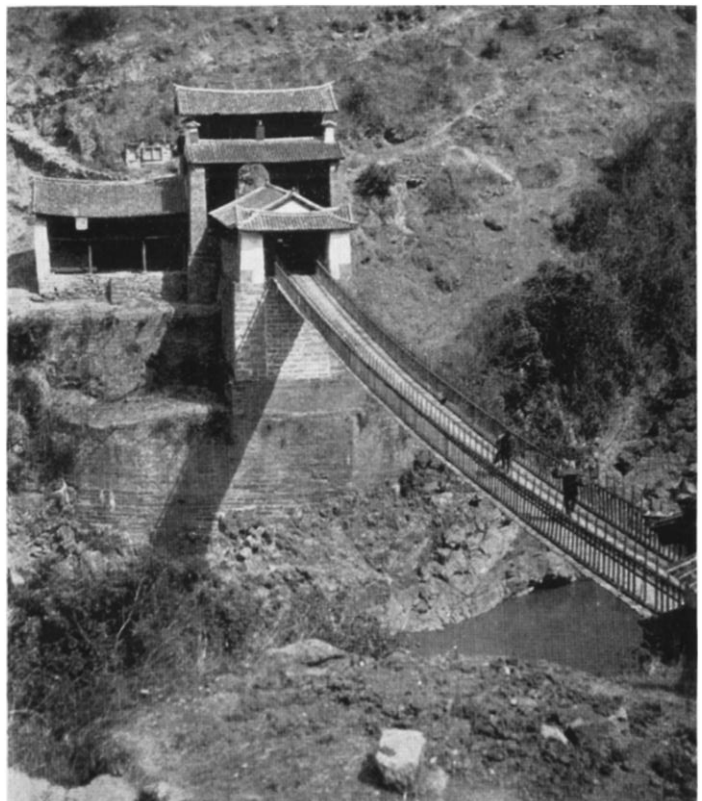
1. KUNLONG FERRY, NORTHERN SHAN STATES

2. RICE TERRACES IN SOUTHERN YUNNAN

3. THE MONASTERY, YUNGNING



4. ROCK TEMPLE IN SOUTHERN YUNNAN



5. CHAIN BRIDGE OVER THE MEKONG

Already the flora, though the Indo-Malayan influence was not yet entirely eliminated, was predominantly Chinese.

On April 25 we continued down this valley by a remarkably good road to the paddy plain below, where stood the wretched Shan village of Chenkang. There was a dilapidated temple here, occupied by ten equally dilapidated soldiers, ostensibly guarding the road; but as they smoked opium and gambled all night: as moreover, though armed with ten antique muskets no two of them alike, they had omitted to supply themselves with ammunition, I expect that their job was a sinecure. That brigands haunted the road was likely enough, but who shall say that these warriors, with whom we passed a restless night in the profaned temple, were not cause for greater alarm?

At some period a wave of religious fervour must have swept over Yunnan, washing even to the confines of the province, where the humblest village boasts its Buddhist temple. But the priesthood have long since sunk into disrepute, the people grown apathetic, the temples fallen to ruin. In the villages the latter are now schools, inns, or stables; only in the cities are they used for religious purposes. Yet the flame of religion still burns brightly in a few quiet spots, where it has somehow been protected. Here and there you may find a rock temple perched up on an almost inaccessible cliff, lovingly tended by some hermit priest who daily performs the rites of his office. Such picturesque fragments suggest that the triumph of Buddhism in China corresponded with the most artistic age, when the idea of beauty was embedded in the hearts of the people.

From this point to Shunning our road lay in a general easterly direction, crossing a succession of hill ranges, separated by valleys which grew deeper and narrower as we penetrated further into the interior. As for the road, it was the best I have ever seen in western China.

On April 27 we passed through a crowded country market, held at a little temple on the hillside. Here, every five days, the scattered Chinese and Shan families of the district assemble to buy and sell. In the evening we reached Yingpankai, the first Chinese village worthy of the name.

Yingpankai, as its name suggests, is modestly fortified, being partly protected by a wall and ditch. It boasts a number of tiled houses, a school (in the temple), and a yamen, but no magistrate. I rubbed my eyes next morning when I saw the broad road contoured round the mountain to turn a spur beyond. Could this be Yunnan? Most roads in western China take every mountain by frontal attack and no nonsense. Yet here was a fine mule road, though to be sure some of the gradients were steep.

Having reached the summit of the range we descended into a deep valley and crossed the river by a rustic bridge. The following day we began the ascent of the Mekong divide, and spent the night at a poor little village about halfway up. I slept in the new school-house, which

was complete in all respects save one—there was no schoolmaster ; consequently the attendance was negligible. On April 30 we reached the pass —about 8000 feet—and descended by a road, still remarkably good, to the valley where stands the city of Shunning-fu. Here we put up at a miserable hostelry, for though a district capital, Shunning is nevertheless a small and mean city, boasting no industry and but little trade in tea, which is grown on the neighbouring hills. One can walk round the city wall in half an hour.

On May 2 we proceeded on our way, marching up the well-cultivated valley and so into the mountains again. Amongst wooded hills the road now wound, with doll-like fields pecked out of the valley heads below. We had heard in Shunning that a new road was being engineered, and there was ample proof of it here ; for the new alignment crossed and recrossed the old road, which, as usual, was only a water-worn gutter. A mass of shrubs, many of them peculiar to Yunnan, clothed the crumbling granite slopes. The Indo-Malayan flora to the west had been finally shaken off, and it does not creep up the Mekong valley from the south even to this latitude.

Crossing the low pass we descended towards the Mekong, halting at the village of Sintsun, perched on the very brink of the gulf; from here we could just glimpse the river, about 2000 feet below. The steep valley reflected the setting sun in flights of silver steps—paddy-fields.

The road down to the river is partly paved, and approaches the gorge on a long slant. For a mile before the bridge is reached it has been cut out of the solid rock, stepped, and protected by a parapet. The chain bridge also is in first-rate repair, and looks far more durable than the bridge on the Bhamo route. It bears the fanciful name "Bridge of the Green Dragon." The ascent on the left bank is not so good, being horribly steep and rough.

Two more ranges have to be crossed before the Yangpi river is reached. On the second night after crossing the Mekong we slept at Alushih, a considerable market village built on the hillside. From there we descended to the Yangpi, which is provided with a ferry only. The mules however swam across, the river being only about 50 yards broad at this season, and very tranquil just here. The Yangpi valley is arid and stony, relieved only by a few pallid shrubs drooping in the grim heat. Below the ferry the river burrows deep into the mountains, and disappears between high cliffs.

Ascending the next range we got back on to the limestone (round Alushih the rock is slate), and presently came upon a most picturesque temple. The road dipped sharply into a narrow ravine by a flight of steps passing under a high cliff. Embowered in trees, now foaming into flower, was the temple, crowning the cliff and difficult of access. The country continued sparsely populated, but well wooded. On May 7, however, came a change, when crossing another range we descended to

the narrow plain at the sources of the Red River and reached Mênghwa-t'ing, six marches distant from Shunning.

There is no bridge here, because there is no river. Lack of water is one of the troubles of Menghwa in the dry season; nevertheless the plain is well cultivated. We crossed a backwater by a mud bund and climbed a river terrace, and that was all we saw of the Red River. Passing through fields golden with wheat and carefully tended market gardens, we reached the city wall and found an inn in the large suburb outside the north gate.

Menghwa looks more prosperous than most *t'ing* cities, and the wall is in good repair; but I had no time to go inside. A guardian pagoda stands on a cliff above the gorge to the south, where the mountains close in and the streams unite to form a river; its influence is doubtless responsible for the prosperity of the city. It was a market day, and the streets were crowded with Lolos from the surrounding hills.

On the following day we turned due north, and by evening had reached the foot of the mountains at the upper end of the valley. On May 9 we climbed the divide separating the basins of the Red River and the Mekong, and from the summit looked down on to the Tali lake (Erh Hai). This range is a favourite haunt of brigands, who flourish despite a watch near the pass and a constant stream of traffic between Menghwa and Siakwan, or perhaps because of these. Descending to the lake we reached Siakwan that afternoon, and Tali the same evening.

A few days later we took to the road again, marching to the head of the lake, where there is a cave in the limestone. On the 15th of the eighth month (*i.e.* about September) a fair called the Yü-t'ang-huei, or "fair of the fishes' hall," is held here, when the fish emerge from the cavern and are captured in basket nets. Only one kind of fish lives in the cave, and it is found in no other part of the lake, so I was told.

Travelling round the head of the lake, we crossed the low divide to the east and entered the basin of the Yangtze. The descent to the river, down a gradually broadening valley, takes two days. Villages are scattered at intervals, but there is not much population, the slopes above being little cultivated; they are clothed with a variety of shrubs, but there are no trees. Above the village of Hwangkiaping is a high cliff, with a Buddha set in a niche near the summit. "Men cannot reach it," said one of the villagers, pointing it out to me. "Then how did they put it there?" I asked. "It flew there!" said a muleteer, and every one laughed. The practical Chinese have few superstitions of this sort.

We reached the Yangtze on May 17, and continued a few miles down the right bank to the ferry opposite Kinkiangkai. After the brawling Mekong the Yangtze always looks immense, spacious, and noble, as of course it is. The ferry-boat is of the usual type, a big barge high in the bows and stern, like a junk. Kinkiangkai is the highest point on the

Yangtze at which boats are in use, a sort of sampan being employed for trips downstream.

We now entered a valley running almost due north. The lower part is stony and rather barren, but from the village of Heiniukwang as far as the lake it is entirely cultivated and fairly thickly populated. The largest villages are Chila, towards the lower end; Chingyukai, about halfway up; and Chikwang, at the foot of the lake.

A little way up this valley we came upon a picket guarding the road, so concluded that it is a route much used by caravans going to Szechwan, though we met none at this season, and few on our return in December. Although the narrow valley—which in places does not exceed half a mile in breadth—is intensely cultivated, with many little villages embowered in trees, the surrounding hills are bare of timber and utterly dried up. At mid-day on May 18 we reached the small lake called Heiwu Hai ("lake of the black mist") occupying the head of the valley.

This lake is about 10 miles long by half as many broad. It has no visible outlet southwards down the valley—indeed owes its existence to ponding, the valley having been blocked by rubble cones shot out from either flank. But the underlying rock is limestone, so that the water no doubt filters through, to reappear lower down the valley.

The western mountains rise steeply from the water, and only a few small fishing villages crouch in the deep bays on that side. On the east the shore slopes more gradually to the hills, and is terraced for rice cultivation. Here villages are more thickly clustered. Much of the foreshore has been recently reclaimed, and the crops are irrigated from the lake by means of wooden scoops attached to ropes, which are swung like a skipping-rope between two persons.

A sharply defined line at the base of the western mountains appears to be a raised beach, and this lake, like so many in Yunnan, is no doubt slowly disappearing; but I was not able to examine it. The lake teems with fish, which are caught in circular hand-nets cast from the shore, or by floating nets set further out.

From Heiwu Hai the road ascends steeply, and crossing the hills, here clothed with pine trees, drops down to Yungpeh-t'ing, six stages from Tali.

Yungpeh is a forlorn-looking city with ruined gateways and ragged walls; like most *t'ing* cities in western China, it is out of a job since the neighbouring hill tribes saw the advantage of intercourse with the dominant race. The plain is surrounded by mountains, those to the east rising some 1500 feet above the city. A stream from this range has cut a deep trench across the paddy land (invisible till one is on the brink), and flows through a conspicuous gap in the western ridge, below which is another plain. Beyond that are the high mountains which enclose the Yangtze.

The country lying immediately to the east of the great bend of the Yangtze is unsurveyed, and I had no certain knowledge of a road northwards from Yungpeh to Yungning. Nevertheless it was probable that

such existed, and so it proved. On May 22 therefore we continued our journey. From the pass which crosses the eastern range a splendid view of the Likiang snow peaks, 40 or 50 miles away to the north-west, is obtained. This snowy range rises very abruptly from the Yangtze, but soon sinks to lower altitudes again. It is the southernmost of the numerous widely scattered snow massifs of Chinese Tibet.

The whole region lying between the loop of the Yangtze and the Litang river is composod of limestone, with occasional bands of slate or other metamorphic rocks. The well-wooded ranges run north and south, and their slopes are sparsely populated with various mountain tribes, chiefly Lao-p'ang and Lisu. The Moso occupy the higher and narrower valleys, while the Chinese have settled to some extent on the few tiny plains met with.

Rocky bulkheads, tying range to range, divide the intervening corridors up into a series of compartments more or less isolated from one another. The streams, after flowing quietly parallel to the main ranges for a space, turn and rend their way through them to join the Yangtze to the west or the Litang river to the east. Thus it was northwards up and down these narrow corridors, from valley to valley, over a succession of bulkheads that our route lay. For the first three days the road threads its way through wooded hills, almost uninhabited except for lonely Lao-p'ang huts high above the valleys. These Lao-p'ang, or Lo-lo as the Chinese contemptuously call them, are said to be great robbers; but unless they rob each other it is difficult to see how they can make ends meet, since so few caravans pass this way. However, patches of cultivation on the steep slope indicate that they have other less precarious sources of livelihood.

After crossing the pass above Yungpeh we descended to a marshy valley, where were a few scattered huts; then ascending another valley, reached a pass and descended through a wooded ravine, camping for the night as soon as the valley began to open out. Just below us were a few huts.

On May 23 we continued down this valley, crossed a stream, and climbing the steep wooded hillside reached another pass at an altitude of 9891 feet. In the valley below us a beautiful orange-flowered Primula was coming into bloom. There were no signs of habitation here, except a small child with some goats; the Lao-p'ang huts are well concealed, and usually high up. The valley we now descended was one of the prettiest we had seen, full of trees and bushes, many of which were in flower. Following the stream down till it turned away to the west, we crossed a spur and presently came down into a wide grassy valley, where we camped again.

Descending through the woods on May 24, we reached the Sha Ho in an hour. It is at this season a shallow stream, 15 yards wide, which flows west to the Yangtze. Once upon a time there was a good bridge

here; the central pier and abutments are intact, but the stone slabs which spanned them are missing, and have been replaced by a few logs. Consequently animals have to ford the stream, which, though easy enough at this season, might present some difficulty during the wet summer months. From the Sha Ho we marched up a broad grassy valley similar to that in which we had camped the previous night. Presently the forest began again, and we reached another pass, from which a high and barren limestone range, running more or less north and south, was visible to the north-east.

From the pass we descended into a charming wooded valley, diversified by open grassy glades, falling water, and broken cliffs. In front of us lay another valley, the stream from which turned west, and up this valley we marched to a camping ground a few miles below the pass. A couple of hours' climb on May 25 brought us to the top of the valley, on the watershed between the Yangtze and Litang rivers, all the streams crossed after this flowing to the east. Close by rose the high range seen the previous day, and far away in the north the tip of a snow peak was visible.

So far our general direction had been N.N.E., but we now turned more to the west. A great change came over the country, for the valley below us, instead of being well wooded, was very barren. Descending this valley we reached a few huts called Meikanho, where the Szechwan road turns off. Up to this point we had been on a highway which, whatever its defects, had at one time been of some importance. Parts of it were stone paved. By the Sha Ho were the ruins of villages long since deserted. What curse has overshadowed this fair country, that men should have abandoned it?

From Meikanho, however, we followed a mere track, descending another dried-up valley to the Lapa Ho, which is a considerable stream. For a few miles we could follow with the eye the Szechwan road on the other side of the valley, and see the white houses of Shingyingpan through which it passes; but after reaching the Lapa Ho, which here flows in a gorge, we saw it no more. By the Szechwan road Taifang is reached the first day from Meikanho, Tiechang on the second day, and Wumuho on the third; beyond that I could get no information. Continuing down the right bank of the Lapa Ho on May 26, we passed several Moso villages, and presently crossed to the left bank by a good wooden bridge opposite the village of Wakai. The river here makes as though to turn off to the east, but after wriggling through the mountains it returns to its former northern course, flowing through the plain of Paichupa.

The Yungning road simply crosses a low spur and descends straight to the plain, near the head of which is the Chinese market village from which the plain derives its name. The Paichupa plain is about 6 miles long by 2 broad, and is the first serious cultivation met with north of Yungpeh. Near the lower end of the plain is the village of Paochukai,

where we found a market in progress. The narrow street was filled with a picturesque throng of Lisus, Moso, and Lolo.

Soon after leaving Paochukai the mountains closed in again, and we were forced out of the valley. The Lapa Ho, after making another S-bend, entered a gorge and presently turned off to the east, while we ascended the limestone range to the west. Again the scene changed. Here were rock-strewn slopes ill clad with ragged shrubs, dry gullies, angular scarps to which the grizzled vegetation clung, tortured by thirst. Ash-grey mountains, fretted into queer shapes, rose against the blue sky, but in the west were higher ranges, their summits furred with pine forest. Up and down rude flights of steps beneath the shadow of the cliff we climbed, till dusk brought us to a few miserable huts set in a natural amphitheatre, from which valleys opened in several directions. This poor place rejoiced in the alluring name of Kinshakow, "the gully of golden sand." Apparently once upon a time gold really had been obtained here. Much more recently iron was mined in the valleys, and large heaps of slag remain to prove it. But this industry too has dwindled, and now there are only two or three mines a few *li* down the valley. Nothing remains to the place save its resplendent name. On May 27, after crossing a pass we descended to another fair-sized plain called Kanpatze, where there are several Chinese villages of the poorer class; the largest is called Paêrhchao. Though the plain is well cultivated, producing rice, maize, wheat and opium, the people seem miserably poor.

Turning east again we crossed a low wooded range, and presently rejoined the valley below in order to continue our march northwards. There was a small river here, but it was not the Lapa Ho; that had already turned to the east, cutting a passage for itself through the ranges. This stream flowed south to join the Lapa Ho, and together they burrowed into the mountains to flow to the Litang river. Crossing this stream, which came from the west, we marched up a valley along either side of which small Moso villages were scattered; then, entering a gorge, camped at the foot of a high range which forms the southern boundary of the Yungning basin.

May 28 was a long day. Climbing the range in front of us we reached a pass 11,260 feet above sea-level, and from the summit obtained a fine view over the mountains of Chinese Tibet, the sharp white towers of the Muli range being very conspicuous. Descending the wooded slopes by an abominable path hacked out of the limestone we reached a shoulder from which the tips of a snowy range west of Yungning rose into view; right below was the Yungning lake, a vivid sapphire lying at the bottom of a pale blue bowl of mountains.

The road now improved, and we quickly descended through pine woods, bright with flowers, to the lake-side. The lake is of irregular shape, its longer axis lying east and west, parallel to the dip of the strata. It is cut almost in two by a spur from the high range to the north-west, off

the end of which is a small rock crowned by a white monastery, the peaceful home of the high lama of Yungning. Here and there along the south-west and north-west shores are deep land-locked bays; the western shore too, along which our road runs, is much indented, but affords a little interrupted cultivation between the mountain foot and the water, where several more villages are buried in the trees. The largest of these is called Laoshuheiko, which means simply "the village by the lake." At the eastern end is a large marshy plain, evidently a silted-up part of the lake, but on three sides bold mountains are rooted in blue water.

Crossing the rim of this basin at the west corner we descended to a small marshy plain, in reality a drying lake. The overflow from the big lake has cut a deep groove through the rock here, but the col is now 100 feet above the lake-level, and no visible water finds its way to the Yungning plain by this route.

There is a high limestone peak at this end of the lake, with a long scarp overlooking the Yungning plain. Caught up amongst a tangle of spurs lying at its foot are several small lakes and marshes, the latter now emerald-green, spangled with flowers. The Yungning plain itself, reached by a corridor winding through the hills, is clearly an ancient lake-bed, formerly fed from the upper lake. We reached the monastery on the far side of the village at dusk, having marched for ten hours; thus the journey from Yungpeh had taken seven days. However it is really eight stages for pack-mules, at any rate in winter, when the days are short. In November we took eight days over the return journey. Yungning is a straggling village, with a yamen, where the *tussu* lives, and a monastery; there are very few shops, the population being almost entirely Moso, who cultivate the plain.

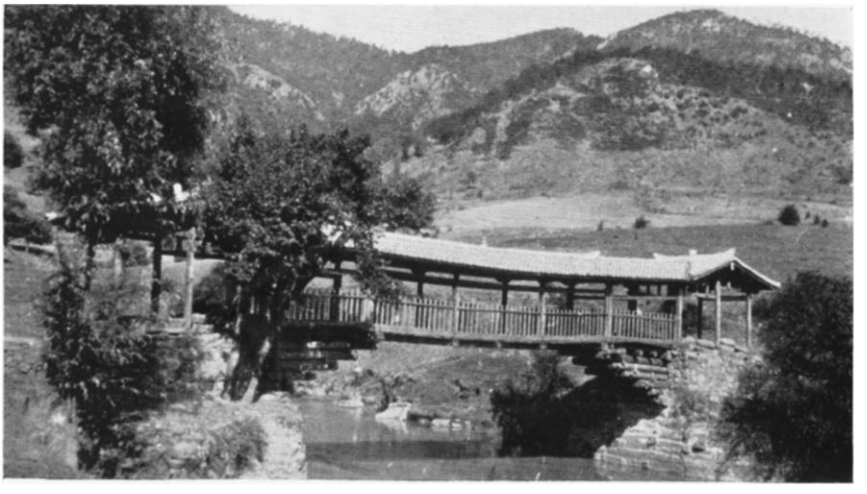
From the high western range flows a river, formerly crossed by a good stone bridge, which is now destroyed; a stout wooden structure has taken its place. The monastery is quite small, and is chiefly notable for a curious blend of styles, the main architecture being Tibetan, while the roof and minor ornamentation are as distinctly Chinese. I spent several days at the monastery, and before I left the head lama, a fat jovial Moso, came over from the island to see me.

On June 2 we resumed our journey to Muli. After travelling to the head of the plain the road divides, one branch going to a village called Lichiangtze, while the other keeps due north, presently reaching a big stream from the Muli range; next day the roads reunite, as there is only one path over the divide. June 3 saw us following up this stream and beginning the great climb. Camp was pitched on a steep meadow slope, yellow with a species of Roscoea, growing like crocuses at home. After halting for a day to explore the cliffs, we continued the ascent on June 5, but, coming into a perfect garden of flowers just below the pass at an altitude of 15,000 feet, we halted for a couple of days. Finally on June 7

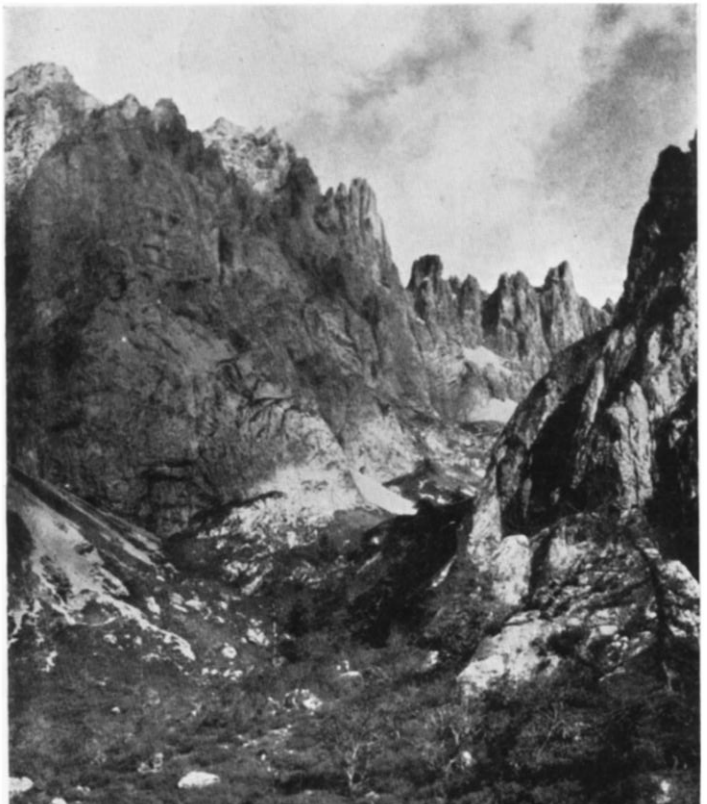
6. THE KANGKALI RANGE

Note: Nos. 6, 7, 9, 10 illustrate more particularly Mr. Ward's paper on "The Glaciation of Chinese Tibet" in the May 'Journal.'

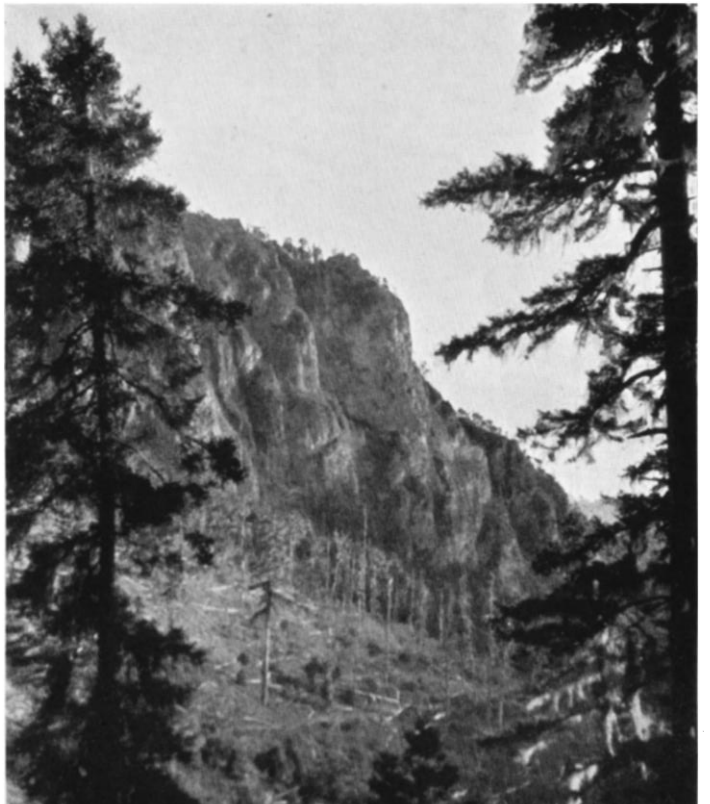
7. LIMESTONE RANGES WEST OF MULI, THE WATERSHED BETWEEN THE SHOLO AND LITANG RIVERS



8. WOODEN BRIDGE OVER THE LAPAHO NEAR YUNGNING



9. BARREN LIMESTONE CLIFFS AND SCREES ABOVE MULI: 15,000—16,000 feet



10. FIR FOREST ON THE LIMESTONE RANGES ABOVE MULI

we reached the monastery of Muli, above the Litang river, or Li Chu, as it is called there, and I was given quarters in the house of the cobbler.

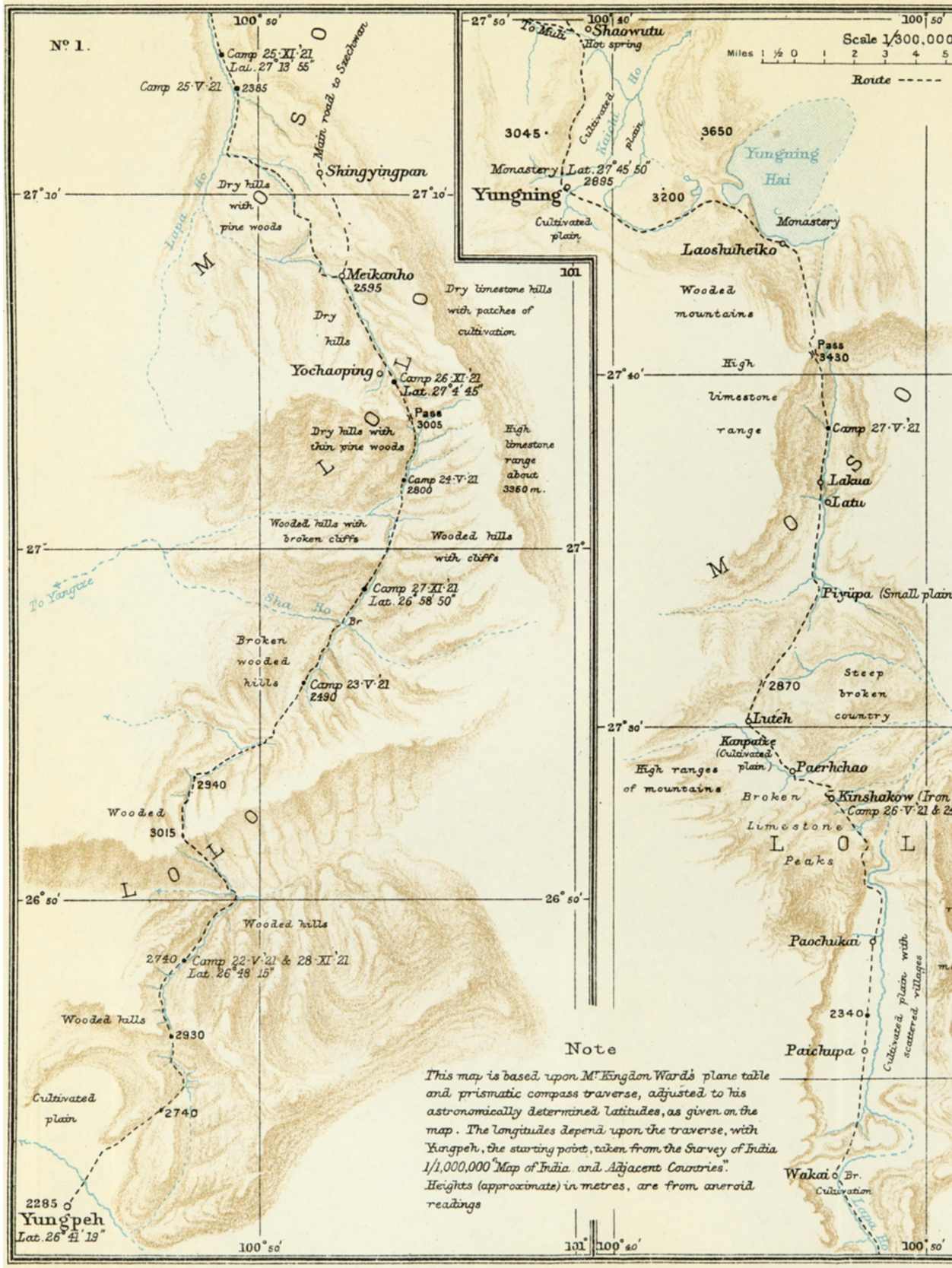
Amongst the three or four Europeans who have passed through Muli on their travels are Mr. Amundsen the missionary, General H. R. Davies, and Mr. R. F. Johnston; but I venture to think that not one of them received the welcome accorded me in 1921 at the hands of the grand lama. The story of my five months' residence at Muli however cannot be told here; I had reached my destination after crossing Yunnan.

THE WIRELESS RECEIVING EQUIPMENT OF THE HAMILTON RICE EXPEDITION, 1919-20

John W. Swanson (communicated by Dr. Rice)

THE radio equipment of the expedition of 1916–17, while a sensitive and high-class instrument, did not fully meet the requirements of a portable receiver for an exploring expedition in tropical South America. The apparatus consisted of many pieces requiring assembling each time it was used, was weighty, bulky, delicate, and necessitated large antennæ to procure results. In the Amazon valley, the home of "static," it soon became apparent that "static traps" in the form of antennæ were not to be desired. Furthermore, it was no easy matter to erect antennæ; the trees of any height are very wide in diameter, the wood very hard, and the bark thin and slippery, making the use of climbing irons difficult and dangerous. I learned that early in the expedition of 1916, and employed Indians at every opportunity to climb for me when climbing was at all feasible. They can climb a tree monkey fashion and be at the top while one perplexes himself over the problem. But even an Indian does not care to expose himself to the excruciating pain of the sting of the large ants and other insects that infest the trees, and it was very difficult at times to induce them to climb. Another bad feature of the set was that the only means of charging storage batteries was by the means of a hand generator, a very unsatisfactory device in a tropical country.

With the above obvious handicaps in the radio equipment of 1916 in mind, the writer immediately upon his return from that expedition busied himself with constructing an equipment that would eliminate these handicaps, namely, a set that was durable and in one compact unit and which required no antenna or earth for its operation. Much difficulty was met, because it was no simple problem to place all the required pieces compactly without getting reactions between the various circuits. But finally a satisfactory receiver, comprising regenerative circuits with detector and three stages of audio and radio frequency amplification, was obtained, with the valuable assistance of Mr. Paul F. Godley, radio receiver expert.



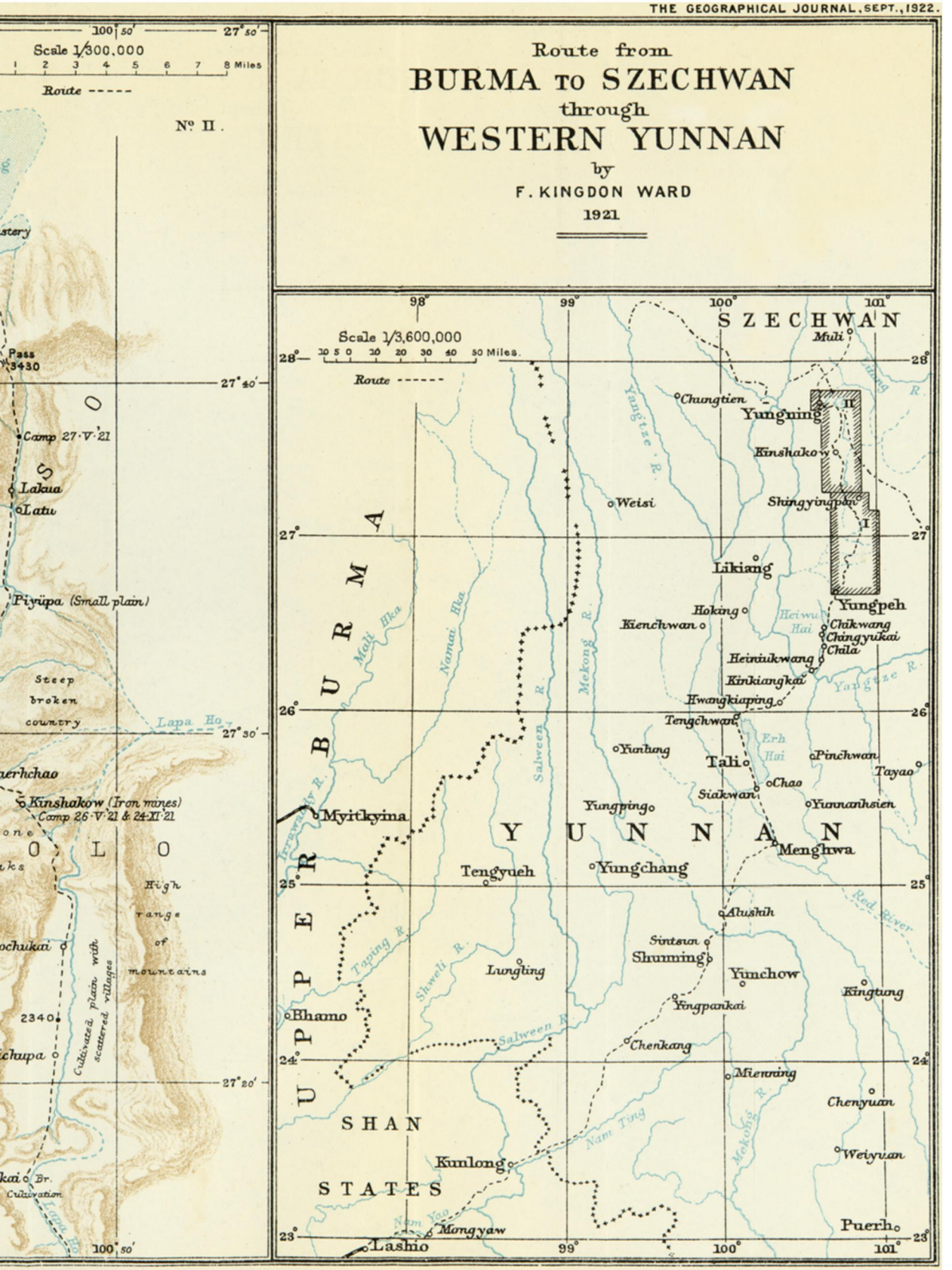
Published by the Royal Geograph

Route from BURMA to SZECHWAN through WESTERN YUNNAN

by

F. KINGDON WARD

1921



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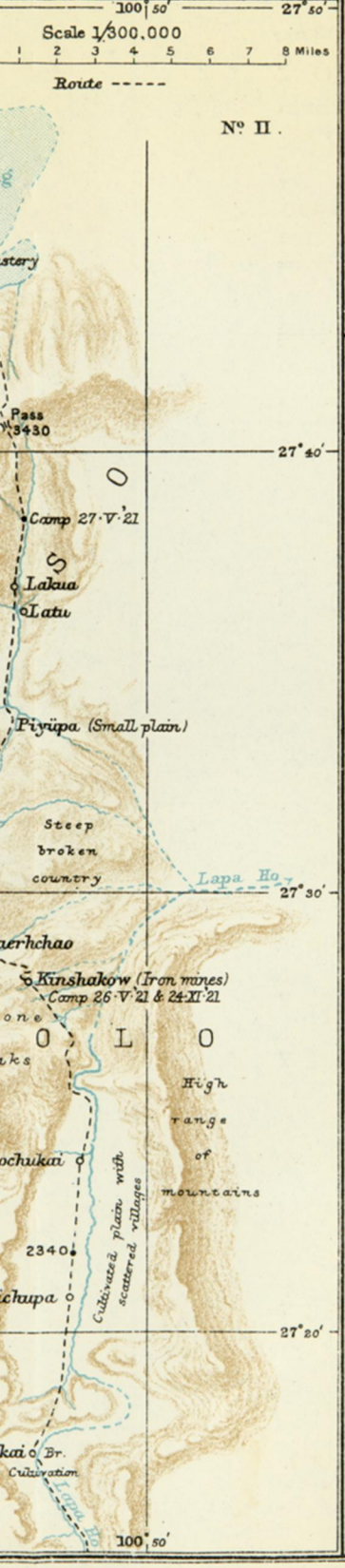
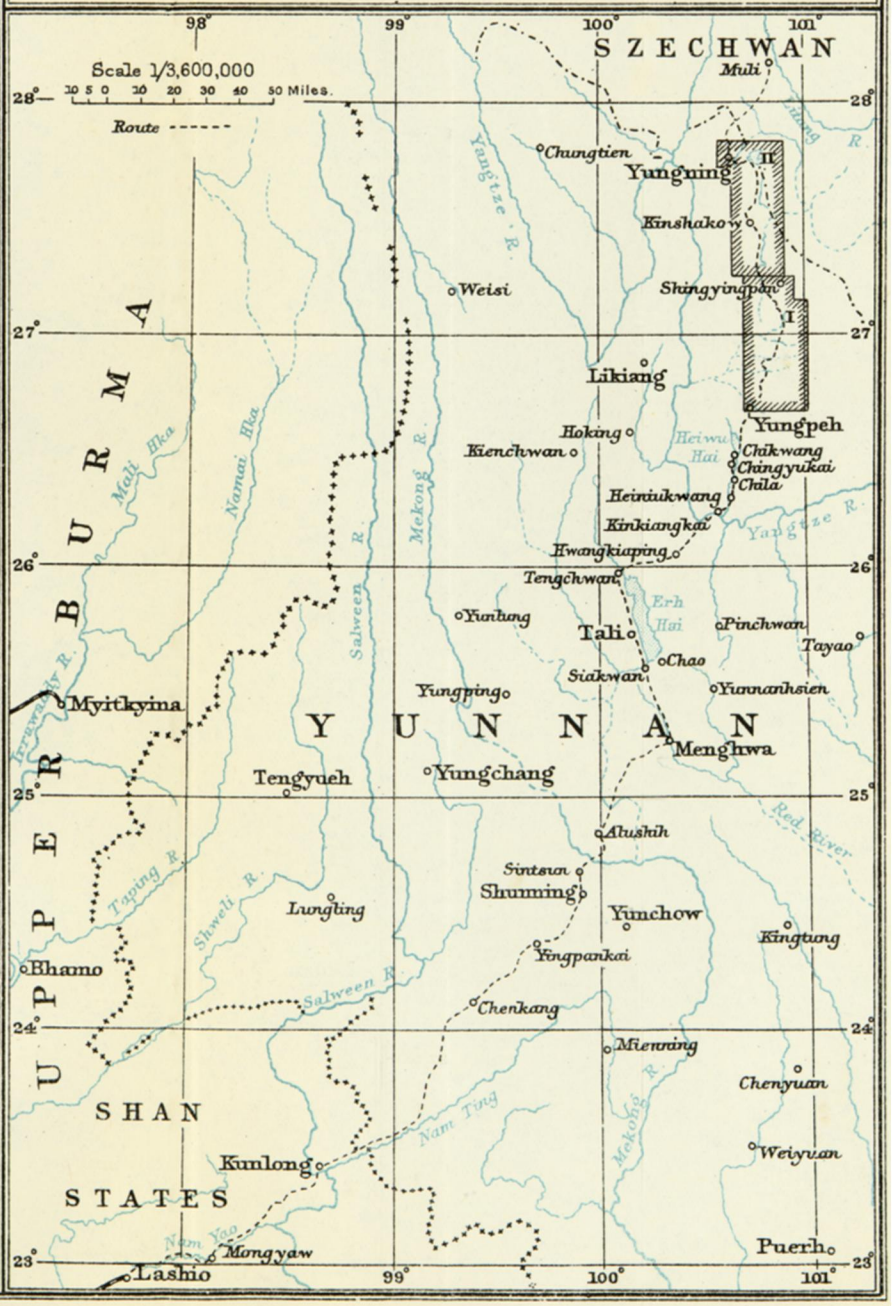




y the Royal Geographical Society

WESTERN YUNNAN
Kingdon Ward.

THE MOUNT EVEREST EXPEDITION

THERE is at present very little to add to the summary of news from the expedition which we published last month. The early climbing season of 1922 was very brief. The expedition reached its base camp below the Rongbuk glacier (see plate) at the end of April, when winter still held in the valley: and in the first days of June the monsoon broke and the season was over—at any rate until September. In the few weeks available there were two highly successful climbs, and a third which ended badly in the avalanche. Within six weeks most of the best climbers were out of action by frostbite, and the whole party so exhausted by the prolonged exertion above 16,000 feet that there could be no thought of renewing the attack in the autumn.

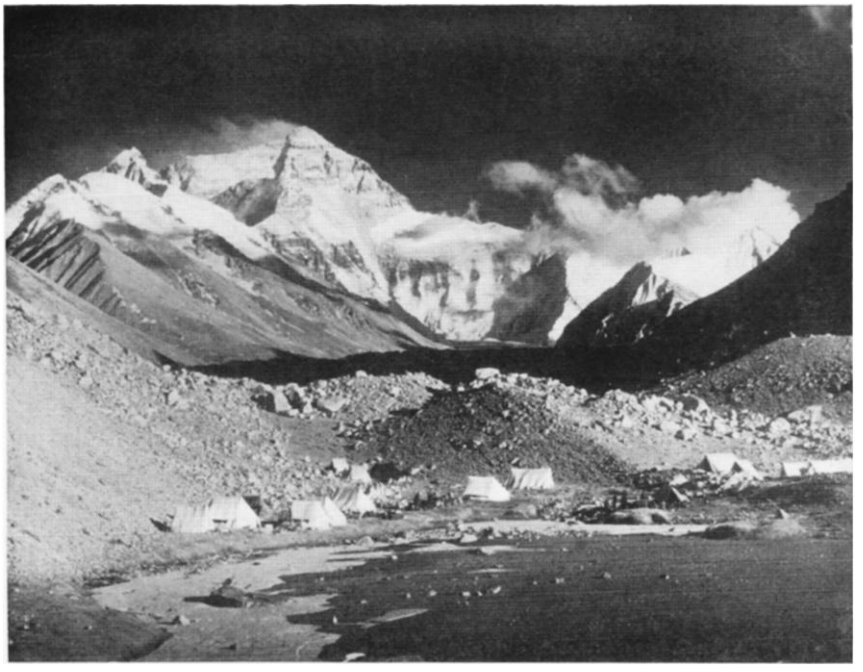
The final conquest of the mountain must wait, then, for a third year's campaign, organized in the light of this year's experience and this year's great though not complete success. Closer acquaintance with the mountain has shown that the physical difficulties are more formidable, the physiological difficulties decidedly less, than had been supposed: the organization and equipment were on the right lines and in most respects perfect. But the weather introduces each year an incalculable factor, against which the best schemes may be laid in vain.

In October those members of the expedition who went out from England will reassemble on the platform of the Central Hall to recount their adventures and to receive the hearty congratulations they have earned so well. The meeting will regret that they cannot welcome and congratulate with them the four officers of the Indian Service whose duty will keep them in India.

By the last reports we are glad to learn that Major Morshead is doing well, and that he will lose no more than the tips of three fingers of the frost-bitten hand. The other members of the party who suffered less are already quite recovered: several are already home and others well on their way. General Bruce with headquarters arrived in Darjeeling on August 2, and the only member of the expedition left in Tibet is Captain Noel, who has established a photographic dark-room at Gyantse, and is hard at work developing many thousands of feet of cinematograph film and a great quantity of plates and panoram films. His leisure he spends in "filming" Tibetan life and customs; and he is not due in England until the middle of October. It will therefore not be possible to show any of the film at the Joint Meeting of the Society and the Alpine Club at the Central Hall on Monday, October 16, when General Bruce and several members of the party will give the first account of their work. A second joint meeting will be held on November 21 for the first show of the film, which will be awaited with great interest. Captain Noel did extraordinarily well in getting his cinematograph camera, fitted with an enormous telephoto lens, to 23,000 feet on the Chang La, and photographing the

Mallory Morshead Finch G. Bruce Longstaff Noel Bruce Wakefield Somervell Strutt Morris Norton Crawford

THE MOUNT EVEREST EXPEDITION, 1922



THE RONGBUK GLACIER BASE CAMP AT 16,500 FEET

CAPTAIN NOEL AND KINEMATOGRAPH CAMERA WITH LARGE TELEPHOTO LENS ESTABLISHED ON THE CHANG LA AT 23,000 FEET

climbing to about 26,000 feet. He writes that the Sinclair camera and the big lens by Taylor, Taylor & Hobson have been a great success. The latter was a heavy addition to the outfit, but it saved his life in the disaster which befell the third climbing party, for it proved too heavy for the climb in the new soft snow below the Chang La, and he had been compelled to turn back from the rear of the party only a few minntes before the train of porters was carried away by the avalanche.

Captain Noel in his letters mentions many difficulties in photography at extreme altitudes: the most curious is the effect of the dry Tibetan climate on the cinematograph film, which cracks and sparkles with electric sparks when pulled through the hand, so that it is necessary to work with a wet hand when threading the film on the developing frames. Happily this effect was anticipated, and the makers of the Newman-Sinclair camera succeeded in making the film run through the gate without friction, and provided open-mouthed film boxes, so that damage from electrical markings is reduced to a minimum.

The official photographs which have come home from the expedition up to the time of writing comprise about 200 quarter-plate negatives on glass, a certain number of large panoram films, and two small V.P.K. films. These are supplemented by good series of pictures taken by Dr. Longstaff and Captain Finch, which have been placed at the disposal of the Committee. A selection of enlargements is shown in the Photograph Room of the Society, but the record must be very incomplete until the arrival of Captain Noel in October with all the larger plates. Enlargements from these will be shown as soon as possible, and the Mount Everest Committee will probably arrange for a public exhibition of the pictures in the Alpine Club Hall after Christmas, as was done last January.

We hope to publish in the October number of the *Journal* a first selection of the photographs in photogravure.

THE ROCKS OF MOUNT EVEREST

Dr. A. M. Heron

DURING the attacks on the mountain by the climbers of the second Expedition, a small collection of rock-specimens was made at heights of from 23,000 to 27,000 feet, under difficulties hitherto unequalled in geological field-work. These specimens confirm the views I reached last year on inspecting the mountain by telescope from the Rongbuk valley from a distance of about 10 miles, and by examination of moraine material derived from its northern faces and spurs.

The specimens show Mount Everest to be a pile of altered sedimentary rocks—shales and limestones—converted into banded hornfels, finely foliated calc-silicate schists, and crystalline limestones. The hornfels and fine schists are in the field blackish or dark green rocks, conspicuously

slabby and with a general low dip to the north, which, I believe, adversely and even dangerously affected climbing. The crystalline limestones are fine-grained pure white rocks.

The specimens from 23,000 and 25,000 feet show in microscope sections a very fine-grained aggregate of quartz and a greenish mica, with irregular lenticles and veins of chlorite and epidote, and in addition sometimes calcite pyrites and sphene.

The mountain, from 21,000 to 27,000 feet, is made up of these black and dark green rocks, with occasional beds of white limestone, and veins of quartz and muscovite granite. From 27,000 to 27,500 feet extends an almost horizontal belt, a sill in fact, of schorl muscovite granite, along the whole length of the mountain, which rock presumably, by its superior hardness, gives rise to the prominent shoulder of the mountain north-east of the main peak (shown as 27,390 on Major Wheeler's photographic survey map). Above this again are black schists. Captain Finch informs me that he saw ammonites at a height of about 26,500 feet, but was unable to collect them.

As to the age of the rocks forming Mount Everest, they may perhaps be assumed, for the present, to be Jurassic or Trias.

REVIEWS

EUROPE

The Palace of Minos at Knossos.— Sir Arthur Evans. Vol. I. The Neolithic and Early and Middle Minoan Ages. Macmillan. 1921. Pp. xxiv. and 721. *Map and Illustrations.* £6 6*s. net.*

GEOGRAPHICAL students who for their special purposes consult this magnificent archæological record will find most of what they seek in the Introduction; and forward references in notes thereto will guide them to the author's grounds for his statements. The geographical result of Sir Arthur Evans' excavations and publication of them consists, naturally, in their demonstration of the part played by Crete before the seventeenth century B.C. in collecting influences of civilization from other lands and distributing her own influence and products afield in a very ancient world—these processes, of course, implying intercommunications by sea, and also some passage to and from continental interiors. The volume of traffic, whether in warfare or in peace, rendered probable by the evidence which he has amassed and expounded, is astonishing, considering the remote dates that are in question—dates long before the Phœnicians, and still more the Greeks, entered the commercial field. Indeed, Sir Arthur makes out a strong case for communication between Egypt and Crete even in the pre-Dynastic age of the former; and a less strong but arguable case for a migration of popular elements from Egypt to Crete, which might explain the suddenness and rapidity of the latter's rise out of the common Neolithic barbarism of the Levant. M. Raymond Weill's interpretation of the submarine remains at Alexandria investigated by a French engineer, M. Gaston Jondet, during the war, is, however, too incredible to serve Sir Arthur's argument.* Nothing could look less like the outline of a practicable harbour, whether

* See *Journal*, vol. 53, p. 201.

The Geographical Journal

Vol. LX No. 4 October 1922

BORDER COUNTRIES OF THE PUNJAB HIMALAYA

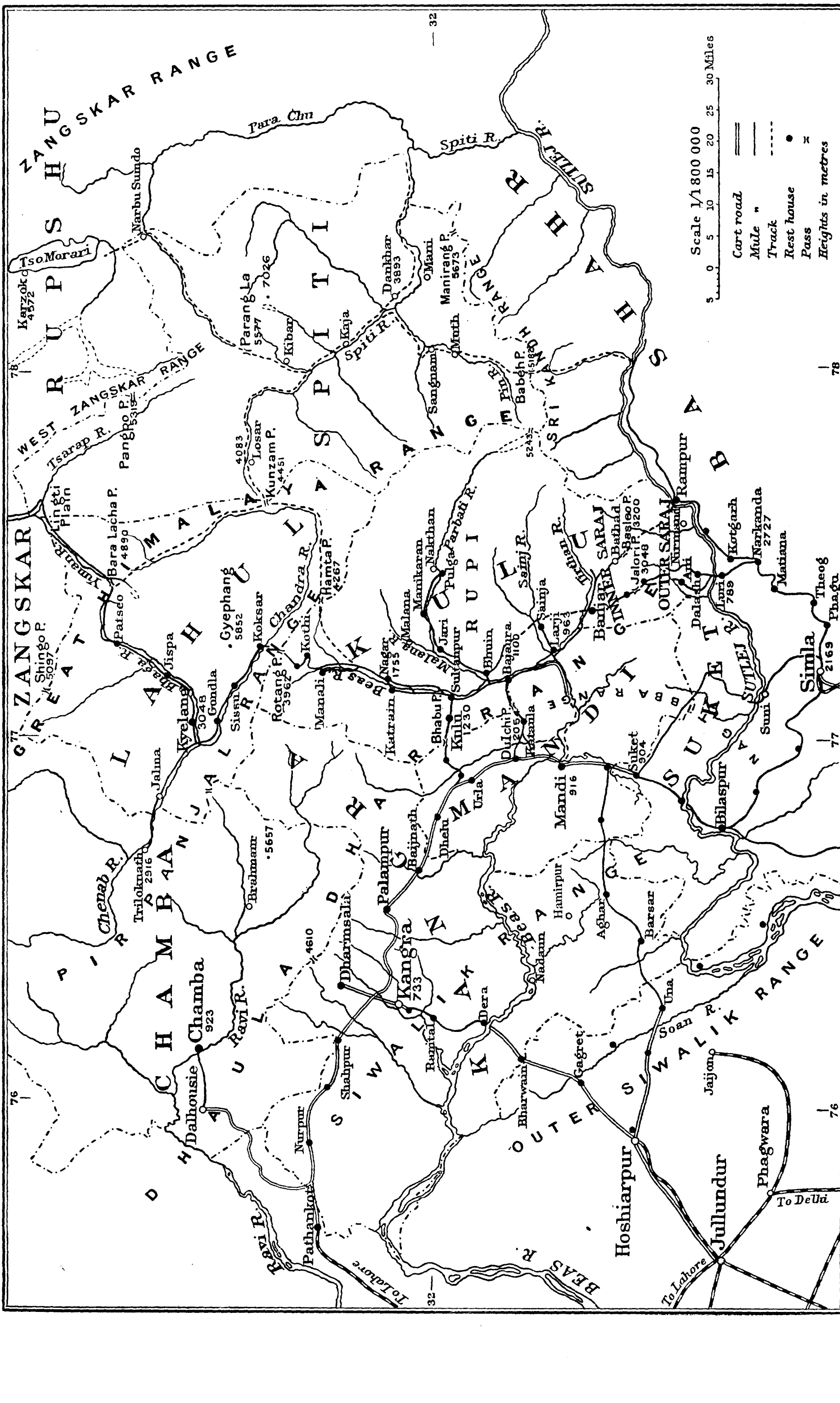
H. Lee Shuttleworth, I.C.S.

Read at the Meeting of the Society, 22 May 1922.

NORTH of the Sutlej river the only tract of British India that touches the Nari Khorsum province of independent Tibet is Spiti, the easternmost Waziri of the Kulu subdivision of the Kangra District in the Punjab. While Spiti is described in the Imperial Gazetteer as being beyond question the most inaccessible part of the British dominions in India, Hindu writers of the past regarded Kulu as the end of the habitable world. In the seventh century A.D. the Chinese pilgrim Hiuen Tsiang penetrated to Kulu and gave a brief and accurate description of it. But he turned plainwards after hearing in Kulu stories of the dangers and precipices of the road north to Lahul.

These three geographically distinct countries of Kulu, Lahul, and Spiti form an administrative unit covering some 6607 square miles of entirely mountainous country. The area is thus considerably greater than Wales, and the latitude corresponds to that of Palestine, but the sea is more than 800 miles away. The population is small—about 125,000—and is composed of the most diverse elements, representing Aryan, Mongolian, and what we may perhaps call survivals of a very early Himalayan race. At least ten languages or dialects belonging to three separate linguistic groups are spoken. In a region where elevation varies from 2590 feet on the Sutlej to 23,050 feet in Spiti, and which spreads over the whole breadth of the Himalayan system of granite and crystalline ranges and even intrudes well into the sedimentary formations of the Tibetan zone, we find an extraordinary diversity of climate, vegetation, and fauna ranging from the sub-tropical to the arctic. In fact, in our small section of the Western Himalaya so rich is the variety in whatever field of study we are engaged, that we are tempted to linger in this valley or that, instead of dealing with our subject on wider lines. Even so, we must now limit our attention in the main to a few selected valleys out of many, perhaps equally beautiful and interesting.

The Sub-Himalaya of Kangra.—Let us approach the Himalaya from the Jullundur Doab. We first cross the low outer Siwalik range, composed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Cart road
Mule "
Track
Rest house
Pass
Heights in metres
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WEST ZANGSKAR RANGE
RUPSHU
SPITI
LAHUL
KULU
CHAMBA
BASHAHR
SUKET
MANDI
KANGRA
ZANGSKAR
GREAT HIMALAYA RANGE
PIR PANJAL RANGE
DHAULA DHAR
OUTER SIWALIK RANGE
Tso Morari
Karzok 4572
Narbu Sumdo
Para Chu
Spiti R.
SUTLEJ R.
Dankhar 3893
Mani
Manirang P. 5673
Parang La 5577
7026
Kibar
Kaja
Muth
Sangnam
Pin R.
Babeh P.
Tsarap R.
Losar 4083
Kunzam P. 4451
Lingti Plain
Bara Lacha P. 4890
Patseo
Shingo P. 5097
Jispa
Gyephang 5852
Koksar
Chandra R.
Hamta P. 4267
Kyelang 3048
Gondla
Sissu
Rotang P. 3962
Kothi
Manali
Beas R.
Nagar 1755
Malana
Manikaran
Nakthan
Parbati R.
Pulga
Jari
Sultanpur
Bhuin
Bajaura 1100
Larji 963
Sainj R.
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Theog
Phagu
Simla 2169
Suni
Luri 789
Dalash
Ani
Katrain
Bhabu P.
Kulu 1230
Kataula
Mandi 916
Suket 904
Bilaspur
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Chamba 923
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Ranital
Dera
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Soan R.
Gagret
Bharwain
Nurpur
Pathankot
Hoshiarpur
Jullundur
Phagwara
Jaijon
To Delhi
To Lahore
BEAS R.

of rapidly disintegrating sediments of Tertiary Age, which contain a few fossils of recent animal forms. Soon we see faintly on the north-eastern horizon the long line of the granite snow-capped Dhaola Dhar, towering far above the low conglomerate and soft sandstone Kangra hills. This romantic and beautiful Kangra country is everywhere dotted with mediæval temples and high-perched castles. It consists of a series of parallel pine-clad ridges and small dales running north-west to south-east and into the Beas and Sutlej. In the 45 miles between the Jaswan Dun, just inside the outer Siwaliks, and the Kangra valley at the foot of the Dhaola Dhar we traverse three main lines of hills, not higher than 4000 feet at their loftiest points. The inhabitants are old-world Hindu Rajputs and other Hindu tribes, but now and then we encounter a Buddhist lama from some monastery beyond the snows on his way to the holy places associated with the life of the Lord Buddha. Five days' marching brings us to the Kangra tea gardens, behind which the Dhaola Dhar rises abruptly for an apparantly sheer 13,000 feet. Here the rainfall averages well over 100 inches a year; 116 inches is the Dharmsala average, but sometimes 9 and 10 inches a day and 160 inches a year are recorded. The range is crossed by the Indrahar, 14,150 feet high, and other passes. On the north-east face the slopes are less steep. Here in Chamba State is the basin of the Ravi, near the headwaters of which rises the Brahmaur Kailas peak, which is said to be Mahadev's summer retreat. Lahul and Kulu, on the upper Chenab and Beas respectively, lie further to the east beyond a still loftier mountain range than the outer Dhaola Dhar.

Boundaries, and Mountain Barrier between Kulu and Spiti.—A reference to the map will show how the Kulu subdivision, which marches with Tibet in the east, is elsewhere almost completely hemmed in by Native States. On the north come the Western Tibetan countries of Zangskar and Rupshu under the Maharaja of Jammu and Kashmir. South along the Sutlej stretches Bashahr State, while on the west the Chamba and Mandi States all but isolate Kulu from the rest of British India. Kulu proper occupies some 1912 square miles on the upper Beas and includes a small area, Outer Saraj, on the north side of the Sutlej. It is inhabited, with one striking exception, by peoples speaking Indo-European dialects, belonging to the Kulu and Sutlej Pahari groups. To the east the Great Himalaya forms a complete linguistic and ethnological divide, besides being a natural watershed. Beyond lies Tibetan Spiti, which is within the geological Tibetan zone. To the north the Pir Panjal westerly offshoot from the Great Himalaya cuts off Kulu from its north Waziri, Lahul. Kulu has access to its two dependencies only by passes closed for half the year, over ranges averaging over 18,000 feet in height.

From Mandi and the Sutlej Kulu is approached by passes 6740, 9480, and 10,000 feet high, of which only the first, the Dulchi, is open to mule traffic for most of the year. Communication between Spiti and Tibet, and

Lahul and Chamba, however, is easy and rarely closed by snow for long. The Spiti river runs east away from the plains before it turns south into the Sutlej, and it is remarkable that not a single river cuts its way through the Great Himalaya between the Sutlej and Indus, a distance of 360 miles. There is no gap between Kulu and Spiti so low as the Zogi-la, 11,300 feet high, that connects Ladakh with Kashmir. The lowest so far explored, but hardly ever used, is 17,200 feet high, and will be described later. The usual routes to Spiti are *viâ* the Chandra valley or by the Sutlej, both involving considerably détours. While the Spiti river drains into the Sutlej, the Tsarap carries the waters of the north part of Spiti and of Lahul beyond the Baralacha into the Indus.

A tongue of Spiti territory extends north-east beyond the Zangskar or Paralasa range into the lofty plain south of Tso Morari, the westernmost of the numerous elevated lakes found in the Tibetan zone.

Scope of this Paper.—I propose in this paper, after a brief glimpse at the well-known Kulu valley, which in rich beauty and grandeur is inferior to no other Himalayan country, to ask you to accompany my wife and myself from Nagar, our Kulu headquarters, east to Tso Morari. We shall linger awhile in the Malana glen, visited by General Bruce in 1912, ascend to the hitherto incorrectly mapped head of the Parbati, and cross into the Pin valley of Spiti by a pass never before, I believe, crossed in this direction by any European. Then, after a visit to the main Spiti valley, we shall reach Tso Morari by the Parang-la. Returning over the Pangpo-la, also on the Zangskar range, we shall find our way back to Kulu *viâ* Lahul. During this return journey we shall see the Tsarap tributary of the Indus and the sources of the Chenab. The vast district of Kangra, which includes Kulu, contributes something to every great river of the Punjab plains, with the sole exception of the Jhelum. Our journey will lead us over 490 miles, and will, I hope, give a fair general idea of the rivers, glaciers, and mountain barriers of this part of the Himalaya, besides bringing us into contact with some of its diverse human communities.

The Kulu Beas Valley.—Instead of entering Kulu from Mandi by the present routes over two lines of hills, let us follow the gorge through which the Beas escapes at Largi into the sub-Himalayan region. Here a motor road is being laboriously blasted out along the precipitous faces of rock that overhang the river. At Bajaura we enter the foot of the Kulu valley, here a verdant open dale with numerous small hamlets amid fields that are covered with rich crops of wheat, barley, mustard, and the opium poppy in spring, and with maize, rice, amaranth, and many pulses in the autumn. On either side of the valley rise gentle slopes luxuriant with a wealth of varied forest growth up to above 11,000 feet. The banks and islets of the Beas are densely wooded with alder thickets (*Alnus nepalensis*). On the hills forests of three main varieties of mountain oak, deodar, blue

THE UPPER BEAS VALLEY IN KULU FROM NAGAR

AN UPPER KULU SHEEP RUN IN SILVER FIR AND SPRUCE FOREST

SNOWFIELD AT HEAD OF PARBATI, AND PASS TO THE PIN IN SPITI

THE PARBATI MORAINE FROM 13,520 FEET

pine, spruce, silver fir, ash, and silver birch present to the view masses of varying depths of green. Walnut, horse-chestnut, maple, elm, mulberry, and in the Parbati the chil pine are also found. At about 5000 feet the giant tree rhododendron (*R. arboreum*) attains a height of over 40 feet, and, just beyond the birches 6000 feet above the red rhododendron, the mauve shrub rhododendron (*R. campanulatum*) flowers even before the snow melts. The abundance of wild flowers in the dales, forests, and especially above the snow line defies all verbal description. Perhaps among the most striking of the Alpine flowers are the blue Himalayan poppy, the yellow violet, the beds of mottled iris, and the numerous clumps of primulas, but the masses of variegated colour that in the rains adorn the high sheep runs or *thaches* impress one most. The wild fruit trees, apple, pear, peach, apricot, cherry, currant, raspberry, and walnut, and the recently introduced European and American varieties in the fruit gardens are an important economic feature of Kulu. Fruit does well, as the climate between 4500 and 6500 feet is favourable, and here the rainfall is only 30 inches per annum, less than a third of that at Dharmsala on the outer slopes of the Dhaola Dhar. In March and April fruit blossom adorns the valley throughout its length and breadth. The fauna need not detain us, as it is much the same as in the adjoining hills. There is little detailed geological information available about Kulu, which is practically all slate, schist, and garnet. From above Bajaura we first see the snow cone of Gyephang in Lahul peeping over the Rohtang pass at the head of the Kulu valley, where the Beas has its traditional source. In its 40-mile course thence to Bajaura the river drops 9500 feet. In the first 10 miles the fall is 7000 feet, nearly three-quarters of the total drop. Bajaura is only 3600 feet high. Cultivation and human habitation extend to above 8000 feet. Till June the Rohtang, 13,000 feet high, is not clear of snow, the winter accumulations of which are 40 feet or more deep in late February.

Kulu People and Religion.—The agriculturists of Kulu are preponderatingly Kanets, who, according to the most recent authority, were in all probability among the earliest Aryan invaders of the Himalaya. Their religion is peculiarly local and entirely different from the Hinduism of the Punjab plains and even that of the Kangra hills. The gods own a large share of the cultivated land, and their worshippers are also their tenants. The village god is a popular local institution, managed by the Kanet village community in its own interest. It seems to be often a family deity in origin, though it is sometimes a nature spirit exercising sway over a larger but still limited tract of country. This local worship, despite seventeenth-century and other Brahministic importations of Rajput chiefs, is essentially democratic and non-Brahministic. The village gods are extremely human, easily offended, and most capricious. They have their divine or semi-divine relations and acquaintances, whom they entertain and visit on fixed

'At Home' days. Gods and worshippers keep in close communion through the agency of prophets, a remarkable and widespread class found throughout Kulu and the neighbouring hill states. These prophets, like those of the Old Testament, are selected by the deity to act as his human mouthpieces. In Kulu the deity may pick out a man of any caste, Kanet or menial Kohli, as his Gur or prophet. Indian Buddhism, prevalent in the seventh century and earlier, has disappeared and the old gods again hold sway.

The people are cheery and contented peasants, the spoilt children of a rich country that lavishly supplies all their simple wants. Their substantial stone timber-bonded houses of two or more stories are veritable palaces, compared to the mud houses of the Punjab and thatched huts of Bengal. The women can hold their own with any peasantry in the world in comeliness of feature and beauty of colouring, also in grace of dress, though their ideas of cleanliness and marital fidelity may be open to criticism. The Kulu people are aloof and suspicious of outsiders, but insist on discussing their most intimate family and religious affairs with their alien ruler, whom they expect to take, and who fortunately often does take, an interest in these matters. They are much attached to their mountain homes, and dislike even a journey to Dharmsala in the outer hills. Before 1915 they did not join the army, but of the small number that were induced to enlist in the war some served creditably in Mesopotamia, Syria, and Egypt. Their chief pleasures are dancing, drinking, and lovemaking, for indulgence in which pursuits the March to October season of religious fairs affords every facility.

The Kulu man's dress consists of a heavy woollen homespun coat-blouse reaching nearly to the knees, trousers tight at the ankles, a coarse shepherd's plaid, and a small round black cap. The women knot cotton handkerchiefs over their heads like Italian girls, and gracefully drape gay-bordered blankets around their persons as dresses, which they fasten together with large clasp pins. Their jewellery, mostly silver and enamel, is barbaric and effective.

Sultanpur, or Kulu town, the little trade centre of a country, the natives of which want little from shops and seldom care to make money, is 8 miles higher up than Bajaura. Fourteen miles further and 2000 feet higher lies Nagar, the old capital of the Kulu Rajas and now the headquarters of the Assistant Commissioner, Forest Officer, and Engineer. A few other Europeans, engaged in fruit culture, have residences here on the 6000-foot limit along deodar-clad slopes, 1500 feet above the left bank of the Beas. Halfway between Sultanpur and Nagar, the Beas is crossed at Raisan by a typical cantilever bridge of timber. This river, once the exclusive domain of the prolific and sharp-boned mountain barbel, has since 1910 been stocked with brown trout from Kashmir, which at an age of four or five years attain to a weight of six to eight pounds, but rarely take the fly.

Malana.—We shall not approach Spiti and Lahul by the usual Chandra valley routes over the Hamta and Rohtang passes. Instead, from Nagar let us turn up the mountain-side eastward and through deodar, spruce, and fir forests gain the Chandra Kanni pass, 3000 feet below which is situated Malana village. The deep and narrow Malana glen joins the Parbati valley, but so steep and rugged is the chasm through which the Malana river has cut its way out, that the easiest approach to the isolated village is over the mountains. Devta Jamlu, or Jang Jamlu, as the Malanis call him, resides on Indrasau, a 20,417-foot peak at the head of the glen on the Beas-Chenab divide. He is supreme lord of everything in Malana—of the people, animals, the land and its produce. The Malana people relate how he and his wife, Naroi, on their first entry into Malana, rested on the top of the Chandra Kanni. They opened a casket, whence the gods of Kulu emerged and were blown to their present abodes. The casket is still preserved at Malana! This legend symbolizes Jamlu's position compared to the Kulu village gods. He is throughout Kulu regarded as a mighty spirit of the mountains, feared by men and godlings alike. The latter often submit their disputes to his arbitration. His brother, Gyephang of the Lahul peak, and his sister, Hirma or Harimba, now of Manali, but formerly of the Rohtang ridge, share the respect in which Jamlu is held as one greater than local village devtas. Indeed, the proud Malanis boast that Jamlu once exerted his power over the Emperor Akbar in far-off Delhi, and inflicted leprosy upon him, because his tax-gatherers had unjustly extorted from a Sadhu on his entrance into Delhi two pice given to him from the Malana treasury. Even now, year by year in the spring at a spot called Karauni, they commemorate in mimicry the arrival of the embassy, bearing rich gifts, which Akbar sent in order to be freed of his leprosy. Jamlu has no image and no temple, but his spouse, Naroi, has a small shrine. The god does not express his will only through his prophets. Often the divine afflatus descends upon the Ra Deo, the whole assembled body of Jamlu's own people. In the spring the two priests hold solitary communion with Jamlu for several days in a small hut called "Pholobari" till barley seed taken by them inside has sprouted.

The Malana religious practices have been described, but little is on record about the highly democratic theocracy of this isolated village of less than 400 inhabitants. Malana, in fact, abounds with religious and social survivals, some probably dating from a time before the first Aryan wave of immigrants had entered Kulu. In Malana we have the general assembly, or Ra Deo, and an elected senate of eight elders, the Jathira. When even one of them dies, a new set of eight must be appointed. With the elders sit also the three principal officials, namely, (1) the hereditary manager and high priest, known as the Karmishta; (2) the god's own selected prophet, or Gur; and (3) the senior hereditary priest, or Pujari. In most matters of communal interest these two bodies sit

together in the place of assembly. The senate and officials are called collectively the Rigin Nashing, or upper assembly; they sit up above on the raised stone platform, with the Ra Deo in front below. All disputes between residents of Malana are settled by the elders. The only Malana cases that have come before me have been with outsiders. One was Devta Jamlu *versus* a British colonel. They are conducted by the Karmishta, no doubt under Jamlu's instructions. The manager, or Karmishta, is assisted or checked by two bodies, one a treasury committee of five and the other a storehouse committee of four Kothialis, who are appointed by the Ra Deo. Thus in almost every matter the Bari, or officials, are closely watched by the community. Shoi, the Karmishta, I knew well and respected greatly. Sixty-four years old and reserved, he combined business-like acumen and independence with charm of manner and undoubted sincerity, qualities rare in Kulu. In figure he was slight, his face was somewhat drawn and pointed, and his clear eyes had a far-away look, though bright and animated during conversation. When he first came to me he was clad all in black, which emphasized his singular personality.

The Malana language, Kanashi, intelligible only to inhabitants of this one village and different from Kului and Tibetan alike in structure, is of a family represented in a few other small groups of tongues found in Lahul, Bashahr, Almora, and Eastern Nepal, all spoken by hill tribes on the linguistic border-land between Tibetan and Indo-European speech. This has been pointed out by Sir George Grierson in his Linguistic Survey. Kanashi is unwritten and has tones like Central Tibetan and Burman. Dr. Francke thinks it has affinities with the earliest known group of Indian languages, such as the Munda, that belongs to the old Austric family, which is found from Sunday Island off South America to Madagascar and even as far as New Zealand. But in the Linguistic Survey Kanashi is described, not very succinctly, as a "Complex pronominalized Himalayan Tibeto-Burman Language." A few samples of the unusual Malana personal names may be of interest. Aïti, Gui, Buia, Muian, and Shoita are men's names. Women's are Aïa, Chakoti, and Sako. In addition there is also a remnant of what is, perhaps, another language, known as Naroi's speech, since it is used only in her worship. Songs in it are taught by mother-in-law to daughter-in-law. Jamlu owns lands outside Malana in numerous Kulu villages throughout the basin of the Beas—a trace of the time when his worship was general. The Malana folk in a body visit these villages every summer and billet themselves on the inhabitants, who fear the Malanis as weird and uncanny people in league with an all-powerful spirit it is unsafe to offend. Our boastful Malanis affect to despise the Kuluis as fools, who waste their substance on women, beer, and disputes, and contemptuously describe their gods' temples as Jamlu's outhouses. They do not intermarry with Kulu people, except that they take girls from Rashol, a hamlet just outside Malana.

They pride themselves on their peculiar customs and arrogate to themselves a wisdom superior to that of the rest of mankind. Perhaps their little Utopia is after all better off than many parts of our distracted outer world!

The Parbati Valley.—From the summit of the Roshkoling or Rashol pass we look down into the valley sacred to the goddess Parbati, the gentle daughter of Himalaya and bride of Mahadev. Before us is the barrier of the Great Himalayan range, over which our journey will take us. The Parbati has a course some 12 miles longer than the Beas, and probably carries more water at the junction by Bhuin, 3 miles above Bajaura. Both at Manikaran and Kheir Ganga in Kothi Kanaur, 22 and 40 miles above the confluence, occur groups of hot springs. Others are found in the upper Beas and the Sainj valleys. The hottest Manikaran spring reaches 201·2° F., and is used for cooking food. Others are utilized for thermal bathing establishments. The water issues from granite and contains carbonates of iron and lime, but no sulphur. The name "Mani Karan," or "Ear Ring," perpetuates the local legend of the origin of the springs. Once on a time Parbati placed her ear-rings on the bank before bathing in her stream. During her absence they were stolen by Sesha Nag, King of Lower Underworld. Evidently a suspicious character, he was soon taxed by the gods with the theft. So indignantly did he repudiate the charge that he gave a violent snort. Out of his nostrils came the stolen ear-rings, which his hot breath carried up through the earth and out at Manikaran. Hence the hot springs! Three miles above Manikaran we pass the abandoned Uchhieh silver-mines, for which the Rupi Waziri was once famed. Kulu is rich in silver, copper, lead, iron, and rough slate. Gold-dust is found in the Beas as well as in the Chenab, and tales are told of secret seams of copper and silver in the Malana valley. Twelve miles beyond Manikaran, Nakthan, the last Kulu village, is passed, and for eight days' march we shall see no human habitation. At Thakur Kua, 13 miles beyond Kheir Ganga, an elevation of 11,320 feet is attained. The Alpine flowers near here are marvellous; all arboreal growth, except stunted juniper scrub, has been left behind. Here we halted, sent back our surplus baggage and coolies, and collected a small amount of fuel for a week over bare stone, ice, and snow. Just before Thakur Kua the path is over a rock face, as the valley is contracted by spurs that close in to the river on either side. The monsoon almost exhausts itself just before this point, so the climate and vegetation now begin to resemble those beyond the central range in Spiti. In our next march we crossed to the right bank of the river by an enormous boulder, some 60 feet high, which bridges the stream. It is known as Pandoseo, the bridge of the Pandavas. Opposite it on the left bank is the last nala and glacier with a local name. This is the Dongspal, a name of Tibetan rather than Kulu sound. Perhaps it is a

relic of the days when the Tibetans held all the valleys which give access to Kulu from the east, and so controlled the old now disused trade route from the Shigri in the Chandra valley to Rampur. Henceforth the river runs near to us in a shallow spread-out stream or streams, instead of in a deep narrow gorge, as it did near Nakthan and Kheir Ganga. The valley, as we progress, curves gradually towards the south. Our camp at Roba Thach, at 12,700 feet, was on the alluvial flat of an old lake-bed. Below it we had toiled over masses of old moraine débris.

The Parbati Glacier.—Three miles above, an enormous moraine tumbled right across the main valley from the west; beyond this dam lay a shallow lake that was drained over the moraine barrier by a gap near the right bank. From an opening beneath the ice and débris issued water from the lateral glacial moraine. From below, this lateral moraine looked like the end of the main Parbati glacier, but the latter was another 1½ miles distant hence, at an elevation of 13,540 feet and 43 miles from our last camp in inhabited country at Pulga. The snout was that of a slowly receding glacier, but observation showed it to be, if anything, a little in advance of the position given it in the 1904 1-inch map, which up to this point was found to be tolerably accurate. This map is based on surveys made in 1894–5 and 1900–1. The surveyor seems to have penetrated only a short way behind here; hence his error in supposing the visible top of the glacier, 6 miles away, to be up against the actual Pin-Parbati watershed. The glacier, in fact, turned to the east, and so continued out of his sight in the shape of a wide icefield at a much higher level for more than 1½ miles further. Its total length is 7½ miles, the largest glacier in Kulu.

The afternoon was spent in endeavouring to fix the position of the glacier snout, a task interrupted by the appearance of some inquisitive burrhel (*Ovis nahura*) on the heights above, and lengthened by the extreme hardness of the rock in which we tried to hew marks. The thermometer fell to under 38° F. at night. Only above 15,000 feet does it fall below the freezing-point at night all the summer. On leaving our camp by a small torrent that rushed down the right bank, we scrambled along the eastern glacial stream for just over a mile of the roughest imaginable going. This took about two hours. Then we arrived at the spot where a considerable volume of water issued from two ice caves in cliffs of thick black ice, surmounted by gigantic piles of moraine débris, which filled the valley from side to side. These tumbled masses of débris, ice, and snow made us search for an easier route along the rocks, but precipices drove us back to the moraine.

We had with us a tent-pitcher, one Jaiwant, who had in 1906 accompanied a former Assistant Commissioner, Mr. F. Skemp, into the Parbati valley from Spiti. Despite the uninviting appearance of its head, he thought he recognized a side nala as the one he had then descended by.

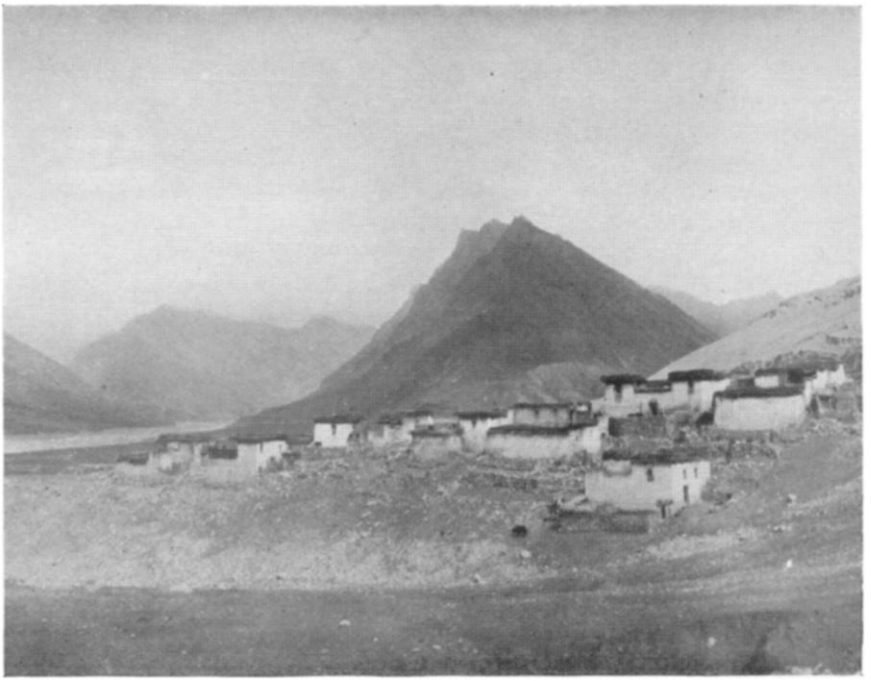
But after two hours' exploration he returned and excitedly reported that the way was blocked by a sheer wall of ice, that looked like the end of the world, and, if he had ever been anywhere near here before, which he now doubted, everything looked absolutely different. Certainly it did, as Mr. Skemp had come over some two months later in the summer, when the ice and snow were considerably less. Owing to the slowness of our progress and this delay we covered only 2½ miles that day, and bivouacked on a little shelf 300 feet above the glacier at 14,850 feet. Our progress was slow, as we were a large party of nine, with fifty-two coolies and two headmen, and had with us almost two months' supplies. This year it was a scarcity of food, both for man and beast, that caused me to visit Spiti in order to organize relief measures. So the coolies had full loads and the pace was slow.

We went to rest looking out on to three magnificent lateral glaciers, deluded by the incomplete survey map into the expectation that before 10 a.m. next morning we should be over in Spiti after an easy 4 or 5 miles' walk. The largest glacier opposite us seemed to present a practicable route westward over into the Rakti nala at the head of the Sainj valley between mountain peaks we had previously seen from the other side. In the revised 4-miles-to-the-inch map published in 1916 the Sainj is wrongly drawn as rising in the Great Himalaya. This error is also copied in a 2-miles-to-the-inch Forest Department map published in 1919. In reality, the Sainj rises in the range to the west of the upper Parbati. While both these maps cut off the upper 11 or 12 miles of the Parbati, the 1-inch map contains everything except the great snowfield on the upper glacier, which is little over 1½ miles wide from east to west. The omitted area amounts to some 5 square miles. The 4-miles-to-the-inch Indian Atlas sheet places the trijunction of Kulu, Spiti, and Bashahr, which is just south of the pass, approximately 10′ too far west and 15′ too far south. In it the drawing of the entire Parbati and Pin valleys above Thakur Kua and Baldur, respectively, is fanciful. The Pin in Spiti is made 10 miles too long. No even approximately correct map of the upper Pin valley yet exists, though in 1884 Sir Louis Dane, the first to explore these two valleys and cross from Spiti to the Parbati, pointed out that the mapping of the upper Parbati was wrong.

From our bivouac we descended on to the moraine and, once we reached its central hump, had an easy 4¼ miles' gradual ascent, first for a short way on rock and ice, and then over snow nearly to the position assigned to the watershed in the 1-inch map. But here to the east we were confronted by a very much hummocked wall of black ice apparently 300 feet or more high. It was evident that at this point (15,700 feet) the glacier came tumbling down between the base of two mountains in a sort of gigantic cascade from a higher level to where we stood. Over the ice wall and far beyond to the east we could just see the summit of a lofty peak. Two of us ascended the rock face to the south of the ice-fall to

prospect, but failed to find there any practicable route for laden coolies. Then we climbed up to the peak above, 1500 or 1600 feet higher than the base of the ice-fall. From it we looked east on to an extensive glaring snowfield, which gently sloped up to a bold serrated ridge with a low gap in the centre. Beyond the ridge we saw some not much lower mountain ranges, that ran away from the main ridge into the distance. There could be no doubt that we had at last located the watershed, and the surmise that the distant ranges beyond were on either side of the upper Pin subsequently proved correct. Our point of vantage also enabled me to discover an extremely steep but apparently practicable back door ascent from the lower glacier to the upper snowfield round the north side of the mountain on which I stood. There only remained time that afternoon to lead the party 1½ miles back down the soft and now ominously cracking glacier and 400 feet up above its right or east bank by a steep nala. Then at 15,750 feet we bivouacked on narrow rocky ledges. The next morning, July 6, we first negotiated a rocky ascent precipitous in places, where the rope was used; then we descended along a narrow rocky ledge on to a small glacier. But before we crossed this ledge heavy monsoon clouds came sweeping up the Sainj valley from the west and snow began to fall. A halt was called and temporary shelters erected, but happily before 11 a.m. clear blue sky appeared in the west, so on we went down to the snow. Then we zigzagged up a narrow and very steep snow slope, that was banked between the ice at the top of the small glacier and the base of the mountain ascended by me on the previous afternoon. We now found ourselves at an elevation of 17,000 feet on a low rocky wall, which separated the minor glacier we had just ascended from the large snowfield I had prospected the day before. We were above the ice-wall that had stopped us the previous morning. By 3 p.m. we were halting at an elevation of about 17,200 feet in a rocky gap on the Pin-Parbati watershed, 40 or 50 feet above the snowfield we had come over for the last 1½ miles.

The Pin-Parbati Divide.—The scene that met our eyes was worthy of the Great Himalaya. The camera gives some suggestion only of the broad vista towards the south-east, but its record is more adequate than words could be. The imagination too could not fail to be impressed by the thought that the civilization before us was Tibetan for over 1200 miles up to the borders of China, and Hindu civilization and Aryan languages had been left behind. We had visited the birthplace of the goddess Parbati, daughter of Himalaya. The mountainous region in front was, in formation and origin, entirely different from the Himalayan zone that stretched from the Dhaola Dhar to the range on which we stood. Here in primæval times lay the vast ocean named the Tethys: in the sediments 20,000 feet deep of this zone is represented almost every marine deposit from the time of the earliest known appearance of animal



KYI VILLAGE AND MONASTERY, LOOKING NORTH UP THE SPITI VALLEY

CONFLUENCE OF THE PIN AND SPITI RIVERS, FROM DANKHAR, SPITI

KYELANG, LAHUL, LOOKING DOWN THE BHAGA VALLEY

CONFLUENCE OF CHANDRA AND BHAGA RIVERS AT TANDI, IN LAHUL

life. We erected a cairn to commemorate the first crossing of the range at this place by an English lady, my wife, and the first ascent from the Kulu side by any European. My predecessors, Sir Louis Dane in 1884 and Mr. F. Skemp in 1906, had both crossed from the Spiti side later in the year, perhaps by somewhat different routes from that taken by us.

Pin Valley in Spiti.—We camped in Spiti on the right bank of the Pin 3 miles beyond the pass at 14,890 feet, after a troublesome descent in the late afternoon over a treacherous, much-crevassed glacier covered with soft snow. Opposite our camp a large glacier from the north-west joined the Pin. A late start was made next day, as our coolies were fatigued and some needed medical attention. We first forded a stream from the south-west, and then crossed to the left bank of the Pin by a snow-bridge. An easy march took us to a sheltered and grassy camping ground facing the nala, which joins the Pin at Baldur from the direction of the Han-la or Babeh Pass that leads over into the Sutlej valley. Here flocks of goats and sheep were grazing, and the Bashahri shepherds gave us plenty of welcome milk. At Baldur are some remains known as Lyungti Khar, or Kulu forts, erected by a Kulu invader, perhaps Raja Man Singh or Jagat Singh. From here our Kulu men returned, and after a halt our baggage was carried to Muth, 11 miles distant, on yaks, which we had sent for. On this march we had a number of deep streams to cross. We were impressed by the excellence of the grazing and by the abundance of wild willow and other growth. Wild rhubarb and onions were plentiful, and were appreciated by us. The rainfall appears to be greater here than in the main Spiti valley. Muth, the first Spiti village with the exception of a few houses at Shian on the right bank 3 miles back, was a prosperous-looking hamlet of flat-roofed houses of Tibetan type, with fields green with young barley. The banks between the fields were ablaze with the large flower of the opaque light bluebell, which all the inhabitants seemed to be chewing. A broken-down rope bridge spanned the river. The next day brought us to Sangnam, the largest Pin village at the junction of the Parachu river with the Pin. At this camp the local demon showed his annoyance at our intrusion by a whirlwind that upset the tents, buried their occupants, and sent a heavy bread tin, saucepan lid, and tarpaulin flying high in the air for nearly one-third of a mile. The lid went into the river. I suppose the demon was satisfied with his spoils and his handiwork, as he did not trouble us again; but the villagers did, as that evening they came and danced and sang for hours before our tent.

The whole of the Pin valley above here is remarkable on account of the brightly coloured strata of the hillsides, and the sharp-pointed peaks that in July carry little snow under 18,000 feet. Its general aspect is quite unlike that of the main Spiti valley, which is more enclosed, so that few peaks and practically no snow is visible. Here the conglomerate formations, so frequent and striking at Dankhar and above, are absent.

Spiti is a perfect geological museum, as numerous series of strata are exposed to the view, and there is practically no covering of vegetation as in Kulu. Though there exist no accurate large-scale topographical maps like those made in Kulu for forest purposes, many parts of Spiti have been closely examined by geologists, especially by Sir Henry Hayden, to whose memoir of 1904 reference can be made by those interested. Red hæmatite and galena are found in small quantities. From the latter bullets are made locally. Gypsum occurs in very large quantities: it is extensively used as a plaster and wash for houses and temples outside and in. It forms an excellent base for frescoes and other paintings.

After Sangnam the Pin runs in a gorge for 8 miles. The view of its mouth from Dankhar Fort is remarkable. Above the right bank, where the river narrows, we pass the Pin monastery by a large poplar tree, said to have been planted at the foundation of the monastery, some eight or nine hundred years ago. Here only in Spiti is found the Nying-ma sect of monks, an early sect prior to the seventeenth-century reformation of Tsong-kapa and his disciples. That reformation has not affected this valley or Lahul, where also some traces of ancient Buddhism are preserved. In addition we have here in Pin an unique and curious set of friars or strolling players, called "Buzhen" (prounced Budjen). Sir James Lyall first described this order, which was founded by one Thang-Tsong Gyalpo, an incarnation of the God of Mercy, Chen-rezig, in order to win people to The Way of Buddha. Their performance consists of a medley of prayer, song, miracle play, and stone-breaking feats. Behind they set up a brightly painted wood altar with its usual appurtenances of images, bells, and offering vessels. Above it is a painting of their founder. Their hair is long and plaited into ropes. They cover their heads for the performance with long streamers of bright ribbon, and they wear pleated skirts also decked with numerous streamers. The rapidity of their gyrations, with their hair, ribbons, and skirts all flying out, resembles that of dancing Dervishes, and the brilliance of their colours, those of Russian dancers. Their jests we fortunately could not follow, as they were certainly not over-refined. They threw the audience, including old gentlemen piously engaged in whirling their prayer-wheels, into convulsions. There are only nineteen families of these Buzhens, who marry like the Nying-ma monks.

Spiti Valley.—There is no time to describe the main Spiti valley in detail. The river within Spiti is 70 miles in length. The total area of Spiti has been calculated to measure 2931 square miles, but only 2372 acres, all irrigated, are under cultivation. The population in 1911 was 3629, and entirely Tibetan. The name Spiti, pronounced there and in Tibet as Piti, means the "Middle Country," perhaps from its situation between Great Tibet and Little or Western Tibet. The language is that of Central Tibet, but it has a few resemblances to the Tibetan of Lahul.

Its lamaism, that weird medley of Buddhism, Tantric doctrine, and demon worship, hardly differs from that of Tibet, except perhaps in the identity of the demons, which seem in Spiti to be more numerous than the men. The dress is Tibetan; so are many of the customs, such as the salutation of the great by extending the tongue as far out as possible and keeping it there.

The villages are situated at elevations varying from 11,000 to just over 14,000 feet. Except at the bottom of the valley, there are no real trees. Near Mani, Lari, Tabo, and Pog we find poplars of fair size and juniper trees. Tabo even boasts one apricot tree. Barley forms three-quarters of the total crops. "Sermo," with its large grains in tiers of four in the ear instead of three, the dark beardless "Nyiu," and "Sowa," which is much like the common Kulu barley, are the three main varieties, but the quality is inferior to that of the similar kinds of barley in Lahul. Wheat, peas, oilseed, and small quantities of buckwheat and millet are also grown. The local seed measure is the khal, or sheep-load, instead of the bhar or man's load of Kulu. The khal is divided into 20 dre; a khal of barley is about 20 lbs., but one of wheat is 4 lbs. more. The domesticated animals are the yak, the famous surefooted Spiti ponies, a stalwart breed of small asses, sheep, and goats. The latter are few in number, under 6000 in all, unlike the vast flocks kept by the neighbouring Kuluis, Lahulas, Kuna-waris, and Rupshu nomads, some of whose animals annually visit Spiti for the summer grazing. Few animals die without being turned into food. The Spitials are great meat eaters; four or five men can finish a small sheep at a sitting after roasting it whole.

Spiti Customs and Government.—In striking contrast to Lahul and Kulu, where all sons share alike, there exists in Spiti a system of primogeniture that serves to maintain the holding of the family intact and to give the vigorous young and middle-aged people the main responsibility for its cultivation. The young do not have to wait for their parents' decease to enter upon their heritage. As soon the elder son grows up and marries, the ancestral house and fields are his. The parents are relegated to a small house with a field sufficient for their wants. The aged are happy cheery people and are apparently quite contented, even when the marriage of their grandson entails a removal to a still smaller house than before. These democratic people settle their own disputes in the village assembly, in which the women also assert their views: they elect their own village Gadpos, or Elders. The Gadpos Chenmos, or circle headmen for the five groups of villages, are elected and dismissed by the land-owners. These five men form the council of the hereditary Wazir, or Nono (noble). The custom, which over seventy years of nominal British rule has failed to end, that parties to suits before the court of the Nono and his councillors must supply them with beer till the case before them is decided, often leads to most protracted proceedings. Indeed, unless

the Assistant Commissioner of Kulu visited Spiti every two or three years, probably few cases would ever terminate before the decease of the parties. Fortunately, crime hardly exists and civil disputes are usually settled in the villages. Spiti does not labour under a cumbrous system of dyarchy or multiplicity of laws. It has been excluded from the operation of the recent "reforms," which are not needed in a country where flourishes a healthy democratic spirit of which there are few signs in India proper. Spiti is never likely to "go dry." Though salted greasy tea is universally drunk, barley beer, which gives the main reason why so much barley is grown, and which is consumed in vast quantities by clergy and laity alike, shows no signs of declining popularity.

The problem of what to do with the younger son is solved by sending him to the local monastery, where he will enter upon his monastic career as the servant and pupil in the family cell of, perhaps, his uncle. Both are maintained on the produce of a field, known as the "da-zhing," which forms a portion of the family holding. When the neophyte, known as "tsun-pa" or "get-sul," has passed his examinations, he becomes a full lama or "gelong." But even then, if his elder brother dies, he may, on payment of a fine, leave the monastery and succeed to the family estate and his brother's widow.

Monasteries.—The monasteries, as elsewhere in Tibet, are found in most picturesque situations. That at Dankhar is perched on a conglomerate pinnacle above the town, the large Kyi establishment surrounds the whole of a pyramidical hill, Than-gyud, just above the junction of two deep ravines, peeps 2000 feet down into the valley below, and to the east faces the holy twin-peaked Jo Jo Gang Milta, 23,050 feet high; Than-gyud's other name of Sakya Gongmig appropriately means the Upper Eye of the Sakya sect. Tabo alone is on a plain. Than-gyud, when on another more accessible site, was burnt down by the Tso-po, Galdan Chang's Mongols, three centuries ago, and Kyi, too, was fired by the Muhammadan inconoclast, Ghulam Khan, during the Dogra invasion. Fortunately Tabo, the most ancient and interesting monastery or rather temple of all, has escaped any such disaster. So far the legend that until the Yang-tso, or Mani lake, should dry up, so long would the temple remain, has proved true. The main hall, with a large four-headed image of Nam-par-nang-zad (Vairochana in Sanscrit), an early Buddha, and with thirty-two almost life-sized images of gods and goddesses seated on brackets round the walls, possesses the most impressive interior in Spiti. So far these thirty-two figures have not been identified, but Dr. Francke, the Moravian missionary, has recently informed me that they may be the gods of the pre-Buddhist Bon-pa religion, of which there are frequent traces in the neighbourhood. The frescoes more closely resemble those of Khotan and early India than those found elsewhere in Tibetan temples. Some probably date back to the tenth or eleventh centuries. Inscriptions show

that, as a Buddhist foundation, Tabo has existed from 1004 A.D. There are in all seven temples. The monks here are now of the reformed Gelugpa sect, as they are also at Kyi and Dankhar. Tabo, like some of the Lahul temples, certainly dates from the days when Buddhism was disappearing from India.

Dankhar and the Parang-la.—Dankhar, the capital village of Spiti, is perched up on the conglomerate pinnacles of a spur over the right bank of the Spiti river. To-day its appearance is almost the same as it was in 1820, when visited by Trebeck from Leh, where he had gone with Moorcroft, the first English visitor to Kulu and Lahul. Trebeck has left an interesting drawing of the village. Dankhar, 12,774 feet high, means the "Cold Fort." At one of our four visits here we stayed in the fort, whence we had an excellent view of the roof-life in the village under us. It is the official seat of the Wazir or Nono who resides at Koling, higher up the valley. There is not a single shop at Dankhar or elsewhere in Spiti!

I wished to travel from Spiti to the extreme north of Lahul in order to inspect the Leh–Kulu trade route from Lingti to Kulu, and also to see some of the work done to improve the approach to the Parang-la in the Sangba Lungba, a difficult river valley, by a man of Kyibar, whom I had persuaded to apply himself to this task. He had left the Thangyud monastery in an irregular manner on account of a love-affair, and had been sentenced by the monastic disciplinary court to expiate this breach of the rules by useful and arduous works, so I found him one beneficial to travellers and difficult enough to satisfy even the monks. Both he and his son, Chepa, were painters and copied several frescoes for me.

So it was that my wife and I crossed the Zangskar or Paralasa range by the Parang-la (18,300 feet), and back by the Pang-po-la (nearly 18,000 feet), which have been crossed by few Europeans and have not been accurately surveyed. The Indian Survey Department has no information as to the height of the latter pass, and has only an entry in a route map as to the height of the Parang-la, which coincided with my aneroid barometer reading. Trebeck in 1820 and Jäschke more recently considered it to be 19,000 feet high. Cunningham gives 18,502 feet, and the 1917 *Gazetteer* quotes this height.

We were able on our journey to follow the upper Parachu, a tributary of the Spiti, which joins it in Tibet; to see Tso Morari, the beautiful 16-mile long sapphire-blue Rupshu lake; and to visit the upper valley of the Tsarap river, which under the name of the Zangskar river joins the Indus below Leh.

Tso Morari, Rupshu.—The knot of mountains we visited drained into the Chenab, Indus, and Sutlej, as well as into Tso Morari, which I think may possibly have a subterranean connection with the Parachu, though there is now no surface channel. The water of this enclosed lake is only

very slightly brackish, which is surprising if evaporation is the only factor in removing the equivalent of the considerable volume of water added to it by its feeder streams in summer and by melting snow in spring. From the south shore of the lake, the gravelly plain gently slopes upwards for 3 miles. Down it the Phirsi Fu stream ripples north in a shallow bed. Almost in a line with the exit of this stream from the hills to the west into the plain is the present surface watershed between the lake and the Parachu, the main stream of which is $5\frac{1}{2}$ miles to the south at Norbu Sumdo. When I stood on the hillside above this watershed, and looked first towards the lake and then towards Norbu Sumdo, there seemed to be no very marked difference of slope in either direction. As Norbu Sumdo is further off and the river channel is under high banks, I formed the impression that the river level there was just a little lower than the present lake surface, and that the watershed was not more than 100 or 150 feet above the lake. My Ross Compensated Watkin Barometer, which could not, of course, be entirely trusted for these small differences of level, indicated Tso Morari as being just above 15,200 feet, and Norbu Sumdo as about 100 feet less. I was unaware at the time that Cunningham thought the watershed to be 700 feet higher than the lake, and that sheet No. 52 of the "India and Adjacent Countries" map showed the heights of Karzok by Tso Morari and Norbu Sumdo as 14,900 feet and 15,300 feet. On these heights I presume Mr. Oldham based his theory of an elevation of the Parachu's bed.

Till accurate levelling is done, it will not be possible to arrive at any conclusive results as to whether Tso Morari has subterranean drainage towards the Parachu. It is unsafe to build hypotheses on heights which are either unreliable or the exact positions of which do not appear from the map. Possibly neither of the two heights in question was taken at the water-level.

Three facts, however, deserve attention: (1) The old terraces above the lake show that formerly the water-level reached more than 200 or 300 feet above the present surface, so that at one time the south shore was much further south. (2) The lake is not becoming more saline, though there is no surface drainage; in 1820 Trebeck found it brackish. And (3) about 2 miles to the south of the watershed near Shialli Chumik the middle of the plain is very swampy, apparently owing to percolation from below, and from it a large volume of water drains into the Para river.

Captain A. Gerard's information of 1817–18 that the Para river issued from the lake may be based on a tradition of an early surface outlet. Moorcroft's map, which is compiled from material collected in 1820, indicates the Phirsi Fu as running into a stream or streams, continuous thence both to the lake and to the Parachu. In 1846, as appears from a letter at Nagar, Cunningham was told that the Phirsi Fu, which then flowed north as now, sometimes flowed south also; he considered

that the lake originally emptied into the Parachu. Undoubtedly, even after the lake had receded as a result of desiccation and evaporation, the Phirsi Fu has continued to raise its bed, which formed the watershed between the lake and river. For the last eighty or a hundred years the stream has more or less settled down to flow north only. Probably the lake originally lost its surface outlet to the Parachu as the combined result of the fall of the lake level and the rise of the mass of detritus brought down by the Phirsi Fu.

At Shialli Chumik, close to the Spiti boundary with Rupshu, we were met by the Gova, or chief of the nomad Chang-pas, who graze their long-fleeced Biangi sheep in pastures 15,000 to 17,000 feet high, and whose great yaks are without the nose-ring, that last vestige of civilization found on Spiti and most other domestic yaks. A little barley is grown at Karzok, 15,000 feet high, where there is a monastery, and the Gova has the one house in the country. The wide plains near Tso Morari teemed with animal life. The kiang (*Equus hemionus*) roamed about in pairs and in herds, often within 100 yards of our ponies. The large hare and great marmot were numerous. The soil was undermined by rats. Geese were nesting, and hundreds of sand-grouse settled down to the south of the lake. The Nahu, or Burrhel (*Ovis nahura*), was as common as in Spiti, and the horns of the Nyan (*Ovis Hodgsoni*) were frequently met with. Though brackish, Tso Morari contained no fish; the streams and lagoons by the lake abounded with small fry.

Pang-po-la to Lingti.—The ascent to the Pang-po-la (under 18,000 feet) from the east was easy, unlike the east side of the Parang, which was covered with hummocked and crevassed soft snow. The crest of the Pang-po (meaning "the green turf summit") was free from snow and grass-covered, as its name indicates; but the descent towards the Tsarap proved to be the steepest bit of screes I had ever been over. The animals put their legs together, sat down, and somehow slid to the bottom safely, and we did much the same. The ascent to the Parang from the west had been trying, but this abrupt descent was infinitely worse. After two camps on the Tsarap we reached Lingti plain. It took us a hard five hours' work, at a place where the conglomerate cliffs dipped sheer into the stream, to hew a path practicable for unladen beasts. Our last march was as much in the river as on land. We had to walk the whole way, as the unshod feet of our ponies had suffered from the long stony marches and the trying slide down from the Pang-po. Owing to the rising river and delay in making the path along the cliffs, our baggage yaks reached Sarchu on Lingti after midnight. Our joy at their arrival was diminished when we found tent and blankets to be dripping with water. The large furze-covered Lingti plain, 14,650 feet high, is well known, as it is on the Kulu–Leh road. Here we parted with our Rupshu nomads, and in two days crossed the Baralacha to Patseo, or Dozang, 36 miles distant.

The Chandra Bhaga River and the Shigri Moraine.—On the Baralacha (16,047 feet) in Lahul rise the Yunan river, which joins the Tsarap, and the two headstreams of the Chenab, which meet at Tandi (9500 feet). From the pass to that point the Bhaga has a fairly direct course of 60 miles, but the Chandra makes a southerly détour round by the Shigri glacier and covers 115 miles.

The inhabited part of Lahul is on the lower 30 miles of these two streams and along the Chandra Bhaga for 15 miles below the junction.

A brief mention of the great Shigri glacier, which has to be crossed on the usual route from Kulu to Spiti over the Hamta and Kunzam passes, may be of interest. It has been surveyed and described by Messrs. Walker and Pascoe of the Geological Survey. It rises near the point where the Pir Panjal branches off from the Great Himalaya. Two striking twin peaks over 21,000 feet high rise behind it. They are known as the Peaks of Good and Evil (*i.e.* Dharmsura and Papsura), and are said to vary in height according as Good or Evil prevails in the world. Of course, now the last-named peak is much the higher. To the south they look down the Tos nala, the mouth of which we passed near Nakthan in the Parbati valley. The length of the Shigri is about 15 miles, and its greatest breadth over a mile. In 1869 Harcourt paced it as 2 miles, but pacing is quite inaccurate amid the hillocks of such a moraine. In 1873 it took the traveller, A. Wilson, author of 'The Abode of Snow,' three hours to cross, and our passages occupied well over two hours. In the mountain to its left are veins of stibnite. The masses of moraine matter on the Shigri were aptly described by Wilson as like the huge ridges of a fallen mountain. Immense boulders and smaller débris are constantly hurtling down the slopes on to the moraine. Two marches lower down the Chandra valley we ourselves once witnessed from close quarters the discharge of hundreds of tons of granite, that formed a part of the summit of a mountain 7000 feet above the river. The whole north portion of the peak split off with a loud cracking, followed by a thunderous roar and thick clouds of dust. Immense stone blocks 30 or 40 feet high came bounding down the slopes and jumped far over the river, here 100 feet in width. The mountains have far from settled down, and the combined effects of alternate intense dry heat and bitter cold are constantly operating to break them up and to fill the moraines and river valleys with their débris. During May in the Chandra valley, from 10 a.m. till late afternoon, avalanches seem never to cease crashing.

Patseo Trade Fair.—But we must return to Patseo, a place on the Bhaga below the Baralacha and 8 miles above the first Lahul village, Darcha, where every August Lahulas, Kuluis, Tibetans, and Chang-pas gather to sell or barter wool, salt, borax, and other products. A little wool is brought here on pack sheep and goats, but immense Biangi flocks are themselves driven down by the Chang-pas and shorn by the Lahula

buyers and their men. These fine sheep are soon hurried away, as they cannot for long endure the low altitude of only 12,925 feet. Patseo is a most busy place for three or four weeks every year. The little stony plains on both sides of the narrow river, here once crossed by a stone bridge, and hence called Patseo by Kuluis and Do-zang by Tibetans (from pat and do, meaning "stone," and seo and zampa, meaning "bridge"), are covered with little tents. Each set of people keeps to its own tent-pitch and uses the same piled stone enclosure to keep the wind off. Besides regular traders—the Lahulas buy or rather pay an advance on the wool the year before, and also own several of the Tibetan flocks—casual buyers from Lahul and Kulu attend; and the smiling Khampa wanderers, who once lived on the confines of China and still keep up the dress of the East, foregather and engage in peddling all sorts of worthless trinkets from the plains. In winter they descend as far as Hoshiarpur and Pathankot, whence some take train to Delhi and even Calcutta. At Patseo, too, we find a few tall picturesque Gaddis with their flocks, which in summer graze on the south-westerly slopes of the Baralacha, and in winter are taken to the lower Kangra hills between the Dhaola Dhar and Outer Siwaliks. The Gaddi's own home is under Kailas in Brahmaur. In August the trade fair is attended by a diversity of hill peoples, but in September Patseo is populated only by large herds of ibex, which come to lick the stones where the Tibetan salt has been piled.

The trade imports into Lahul and Kulu from Central Asia are, if we take into account the communications and means of transport, fairly considerable. In the one year 1918–19, the main imports (in maunds of 80 pounds and valued in rupees) were as follows: Wool, 3878 maunds, worth Rs.1,49,907; salt, 5820 maunds, worth Rs.11,640; and borax, 240 maunds, worth Rs.1200—all brought in on pack sheep and goats: 9050 of these animals were imported in 1917–18, many to go to butchers.

The exports from the Punjab *viâ* Lahul are somewhat insignificant. Only cotton piece goods have any considerable value, *i.e.* Rs.24,898. In 1918–19 silver to the value of Rs.99,893 in coin left Lahul; in all Rs.3,06,689 worth of silver went into Central Asia and Tibet from the Punjab to make up the adverse trade balance in that year. Since 1903 the price of the long-staple Biangi wool more than doubled. A quantity of pashm or fine shawl wool, the downy under-fleece of the goat and other animals that live at great heights, is included among the wool imports. It is remarkable that a large quantity of inferior brick tea from China reaches Spiti and Lahul overland, though these countries are situated politically in a Punjab tea-growing district. In 1918–19 only 312 maunds of Kangra and Kulu tea passed the Lahul Trade Post. A constant stream of grain goes up from Lahul and Kulu to Rupshu and beyond as these countries produce insufficient crops for the support of their inhabitants.

Lahul.—Lahul and Spiti are often mentioned together as if they were much alike; but, at least as regards the inhabited parts, the resemblance is less marked than the difference. Spiti is isolated, and the population is almost stationary on account of the social customs. Spiti people are intensely conservative and stay-at-home. Lahul lies between the three countries of Ladakh, Chamba, and Kulu, which in old days were constantly invading each other through Lahul. It is on the Central Asian trade route from the east Punjab to Leh and Yarkand. The Lahulas are enterprising traders, who wander far afield. They are constantly increasing in numbers, as even their lamas, of the Drugpa sect, marry. Whereas Spiti is uniformly Tibetan in language and civilization, Lahul with a smaller area of 1764 square miles has a population of the most diverse elements and four different languages. In 1911 the population amounted to 7760.

Except in the upper Bhaga and Chandra valleys, where a Tibetan which is midway between that of Spiti and the toneless West-Tibetan dialect of Ladakh is spoken, the three local languages belong to a group quite different from Central Tibetan or Ladakhi. The social and monastic systems have little in common with those of Spiti. In Lahul polyandry is practised, as it is also in Saraj in Kulu, and so a man often finds it impossible to name his father. Primogeniture only prevails in the Thakur or "Jo" noble families, which have a Tibetan origin. The lamas have less power here, and, owing to their not being celibate, are not as sharply cut off from the laymen as in Spiti. There are communities of nuns, a profession always open to the unmarried ugly daughter. Boys and girls alike are taught Tibetan at the monasteries, so the degree of literacy is higher than in Kulu and most of India.

In the Mauchat towards Chamba, Hinduism and ideas of caste have crept in during recent years. The dress is only Tibetan in the higher villages. Elsewhere the men's dress approximates to that of Kulu, but the women's is peculiar to Lahul. It is like a long dressing-gown, girded by a cord. The head is bare, except for a silver lotus-shaped cup from which large round silver earrings are suspended.

The Tantric Buddhism, that Padma Sambhava introduced into Lahul and Tibet in the eighth century, has survived here with less change than it has suffered further east. Lahul, probably owing to its distance and political separation from Great Tibet, was little affected by the monastic reformations of the fifteenth and sixteenth centuries that considerably modified the early Buddhism of Tibet and the main valley of Spiti.

Many of the temples, including the important one of Guru Ghantal or Dil-buri, still preserve the old wood pent-roof form, which is never found in Spiti, but is common in Kulu and Chamba. The proximity of timber, has, of course, something to do with this, but the houses of the laity in Lahul are flat-roofed and remind us of Spiti rather than Kulu architecture. Some of the religious frescoes are of early style, and the

white marble head of the Boddhisatva Avalokiteshwara in one temple is distinctly Buddhist Indian work.

Though Lahul is somewhat lower than Spiti in the inhabited parts, which lie between 9000 and 12,000 feet, the amount of snow-fall is almost four times that of Spiti; 7 or 8 feet often collects at Kyelang. There is also slightly more rain. Water is plentiful, and both trees and crops flourish. Below 12,000 feet the shupka, or pencil cedar, the kail or blue pine, and the bhurj or birch grow in thick forests and relieve the monotony of the bare hillsides. Near villages lines of pollarded willows follow the water-channels, and both the Himalayan and Lombardy poplar (*Populus ciliata* and *nigra*) are planted. The crops resemble those of Spiti, but more buckwheat is produced. The Lahul barley is famed for its excellent quality and is more valued than wheat. The parched barley meal or "tsampa" is delicious and satisfying. In the lower parts of the country two successive crops of barley and buckwheat are obtained. Grass and Ladakh lucerne are grown in irrigated fields for winter fodder for the ponies, cattle, and flocks. Apples, pears, and apricots do well, but ripen late. A feature of Lahul is the number of rose bushes, many of which bear large blooms of a distinctive yellow shade. A botanist has enumerated 282 different varieties of Lahul roses.

The alpine grazing of Lahul is unsurpassed. Foreign sheep and goats to the number of 168,000 have come over the passes in one summer to fatten on the succulent blue grass, or "niru." The Lahulas themselves keep large flocks, also herds of ponies and hybrid yaks, known as "churu" locally and "zho" in Tibetan. The churu cows give fine rich milk, greater in quantity than the pure yak cows give. Yak bulls are kept only as stallions.

Like Spiti the country is directly governed by a hereditary Wazir. He is of the Kolong noble family, which has always displayed the most active loyalty to the British Government. The late Wazir, Thakur Amar Chand, personally took over a hundred of his men to Mesopotamia early in the war. His father, Thakur Hari Chand, travelled extensively in Tibet and Turkestan for the Government, and administered his country with conspicuous success. Thakur Amar Chand's brother has recently been put in charge of the Lahul roads and forests. No Indian officials are employed either in Lahul or Spiti, except on occasional inspection duty. Kyelang, the capital of Lahul (10,100 feet), commands extensive distant views of majestic mountains both up and down the Bhaga valley. The foreground includes many hamlets and sinuous lines of bright green willows and well-watered fields of luxuriant crops. There are flowers everywhere.

The climate is dry and invigorating. "Kyelang under the snows" has a quiet beauty and charm all its own, which the traveller appreciates equally, whether he has come up from the damp oppressive heat of a

Kulu summer or down from the arid wind-swept wastes beyond the Great Himalaya.

Before the paper the PRESIDENT said : I hope you will all congratulate the management of the Society upon the appropriateness of the lectures which it provides. Some few weeks ago, when there was a most awful blizzard, you were provided with a lecture on Mesopotamia. In the heat of the evening of what I understand has been the hottest day of the present year, with the thermometer at 86°, we are provided with a lecture upon the Himalaya and the snowy passes of Kulu and Lahul. Mr. Shuttleworth was the District Officer in charge of Kulu, one of the most delightful spots in the British Empire, and very much like Kashmir in miniature ; he was monarch of all he surveyed in that district. I have much pleasure in asking him to give us his paper.

Mr. H. Lee Shuttleworth then read the paper printed above, and a discussion followed.

The PRESIDENT : Thirty-eight years ago I made my first trip in the Himalayas into this very country of Kulu, and there I was most hospitably entertained by Sir Louis Dane, that versatile genius who was not only Foreign Secretary in India and a great diplomatist, but also Governor of the Punjab. He made his mark in the Punjab as an engineer, and to-night he will appear to us as the explorer of the pass between Spiti and Kulu. I ask Sir Louis Dane to speak.

Sir LOUIS DANE : I first went to Kulu in 1880, a very long time ago, and when I married in 1882 I took my wife there, and we spent a honeymoon of three years in Kulu. She was a much better mountaineer than I was, and she went everywhere with me until there was a baby, and the doctor would not allow the baby to go over passes of 16,000 feet. The baby, I may say, often travelled strapped on the back of a woman or a man, as the case might be, as the by-roads were impassable for any other form of conveyance. I had the time of my life in making roads and making the place passable for four-footed animals. Up to that time the only form of carriage in Kulu, apart from the Central Asian trade route, until you got into Tibet, was laden coolies, and you had to keep gangs of them halted at different stages on the chance of a passenger passing through. Before I left India I resolved to do something for my first and last love, Kulu. We made a better graded road for the fruit and general traffic into Simla, and started the road up the valley of the Beas which you saw in the photographs, and which goes up an even gradient the whole way. If I were in India I should drive into Kulu in a motor-car by the year after next.

I was very lucky when I went to Kulu, because nobody had been there for eighteen months, and things had got rather out of hand. A big mine of sapphires had been found. I dare say you have all heard of the Kulu sapphires ; they are supposed to be the finest there are, and they are found on the borders of Kashmir and Chamba at a place called Zangskar. A shepherd had lost the flint of his flint-and-steel ; he was hunting about for another and found a blue stone. He struck it and found it gave very excellent sparks. He brought down a pocketful of blue stones, and later a man came down into Kulu with a donkey-load of blue stones that he was offering to exchange with anybody for a donkey-load of flour. One European who had been a Forest Officer was offered them, and he said he thought it was all nonsense and did not buy them. They got to Delhi, however, and all Delhi went up there, and there

were all sorts of complications. I might have made my fortune, because after I went up the Delhi jewellers had given out that the sapphires were not real but something else. I happened to know enough about minerals to know that they were sapphires, and if it had not been for the ridiculous proscriptions of the Government, which prevented one from engaging in legitimate trade, I might stand before you to-night as a millionaire instead of being a poor pensioned Civil Servant.

I am sorry that the old castle of Nagar has been given up as a residence and is only used as a court and office. It was supposed to be haunted. A fair Ranee had been accused of infidelity to her husband and was hurled from the battlements. However, her innocence was afterwards proved and she haunted the premises. My wife and I slept in the haunted room and we were never incommoded. But the chaplain from Dharmsala, who used to come and see us once in three years or so, had a very bad night, and I believe that some of my successors were more psychic than we were and they also were disturbed. However, I have no doubt that my relationship with Jhemlu saved me from such minor inconveniences. In fact, I found that relationship with Jhemlu had most excellent results. Whenever I gave an order it was never questioned. Jhemlu's headmen used to come down in the winter and sit for a fortnight in my verandah, and I used to feed them largely and nobly in recognition of our kinship.

You have heard of the Kulu fruit. Peaches, apricots, and apples are all excellent, but the pears are superb. The first growers intended to dry the fruits, but it was clear that America could send a ton for every pound Kulu could put out. My wife and I took in two coolie-loads of apples and pears and asked an enterprising merchant in Simla if he could sell them. He ate one pear and said, "I could sell as much as you can send." We paid Rs.40 a maund (82 lbs.) for pears, and something less for apples. Lord William Beresford happened to pass the shop, ate a pear, and bought the lot. For two years we arranged a coolie *dak* or service of runners for the fruit, and that is how the Kulu fruit trade was started. To get the Kulu people to grow the fruit we taught the Nagar schoolmaster grafting and budding, and he did very well out of it. Later on as Lieut.-Governor I induced the Conservator of Forests to make his men more popular by teaching the natives through them generally something about fruits. I hope that success has attended their labours, but in these hill tracts everything depends on the human agency, and votes and resolutions of Government are useless. The peaches and apricots ripen in the very hot weather at the beginning of the rains, and so far it has not been possible to get them to market in good condition owing to the journey.

Trout is an old story. By changing the position of the hatchery, with the continued assistance of the Duke of Bedford, at long last we succeeded in getting trout to breed in Kashmir through Mr. Frank Mitchell, who was actually in charge of the matter. After six years they sent me from the hatchery a fish weighing 18½ lbs., which is a good size for a brown trout. From Kashmir we got the ova and spread trout through the Panjab hills.

As regards the Pin–Parbati route, which is my only claim to be called a geographer, I was fortunate there. I was young, and I had not much regard for the consequences, and I came down the hill instead of going up as Mr. Shuttleworth did. I think any one who has been over a mountain pass wil know it is one thing to start at 11,000 feet from your camp and go over a pass 17,500 feet and another to start 16,000 feet, as I did, walk quietly in the early morning to the top of the pass, and then saunter down the glacier in the course

of the day. I admit it took me from four o'clock in the morning to six o'clock in the evening, and it was a purely unscientific proceeding. I wanted to save eighteen marches, and did not want to go back by the way I had come. We, however, had great difficulty with the people. They all tried to bolt over the Bhabeh Pass, but I was too quick for them there. I rode on in front and cut them off. Then when we got to the top of this pass we found a very unpromising look-out. I put the pass at about 17,500 feet high. It was about 2 miles across that upper Parbati glacier or icefield, and there was no apparent outlet. The coolies all threw down their loads; even my yaks looked suspicious; in fact, the only animal that was unperturbed was my pony, which proceeded to walk down the other side as though he knew all about it. I pulled out an old survey map, which I quite agree with Mr. Shuttleworth was quite incorrect at this point. I had a sundial compass and a pair of binoculars. Those were the scientific appliances which this first discoverer of the Pin-Parbati Pass employed. I looked at the sun and at the map and said, "This is the road," and I did so because it was the only possible way we could get off where we were standing. Where we were to go afterwards we could not tell. But we got along quite well.

It is a great place for pilgrimage; they come even from Madras to see the hot springs at Manikaran, and some go up to the source of the Parbati, though a great many of them never return. When you see the pictures you can understand that a man from Southern India getting into one of these glaciers is likely to die there from cold or to be caught in a snowstorm. There was a proverb in Kulu that nobody ever saw the source of the Parbati and lived. I was the first white man to see the source of the Parbati and I still live; of course the Kulu people put it down to my relationship with Jhemlu. The priest at Manikaran put it down to the fact that I excavated and restored a very old temple of Raghonathji; and for my services to the temple they took me into the temple and showed me the hot geyser, about 8 or 9 feet high, which is not usually shown. My idea was that if that road had been taken up as a trade route and a track made of some sort on the hillside above the last 4 miles of the glacier, it would be a perfectly easy road, and you could ride across it on a Spiti pony. But, unfortunately, the Spiti people were dead against anybody going there, and they were afraid the Kulu people would come in and steal from them, while the Kulu people professed the same fear and did not want to be bothered by travellers. So I did not succeed in getting anybody to go over the pass for some years. I think Mr. Skemp went over it ten years ago.

I am glad that Mr. Shuttleworth was able to use his camera. In my own time there were nothing but wet plates, and it would have been impossible to carry a camera in the sort of country one went over. He has shown us most beautiful pictures, which make me feel I could go back to Kulu and live it all over again.

The PRESIDENT: You can understand how very popular Kulu is among Lieutenant-Governors of the Punjab. We have another ex-Governor present, Sir Michael O'Dwyer; perhaps he would like to add to the discussion.

Sir MICHAEL O'DWYER: I can claim only a very slight acquaintance with Kulu. The fact is that in the days of my distinguished predecessor (Sir L. Dane), both on this platform and in the Punjab, Kulu was so popular, and that not only with Lieutenant-Governors but with other officials, that it became necessary in the interest of the administration to put Kulu out of bounds, and I had to give an example of my self-denying ordinance which

limited me to one brief tour extending over a few weeks. I am, therefore, able to tell you very little about it, but one thing I can claim: that I was responsible indirectly for the delightful lecture and slides we have seen this evening, because it was when I was Lieutenant-Governor that Mr. Shuttleworth was posted to Kulu. Not only that, but I think much of Mr. Shuttleworth's success in Kulu was due to the fact that he had with him in his wife such an intrepid partner in all his journeys. A very famous predecessor of mine in the Punjab, Sir John Lawrence, used to say that when he found a young Assistant Commissioner with a wife and a piano, he hustled him about from pillar to post until he first dropped the wife and then the piano. In my day we were more considerate, and I may say that one of my reasons for posting Mr. Shuttleworth to Kulu was the fact that the maiden name of Mrs. Shuttleworth was MacGillicuddy—MacGillicuddy of the Reeks—and I thought a young lady who at home was in the habit of running up MacGillicuddy's Reeks would equally be at home at 18,000 feet in the Himalayas. As a result you saw her in one of the pictures at a height of 17,000 feet, and I am sure you realized that she was to the manner born. Mr. Shuttleworth had not to drop his wife, nor his camera, fortunately for us.

There is very little that I need say about Kulu. There is one weird function that I witnessed. We have been told a lot about the local gods and the large part they play in the interior economy of the valley. I was privileged in October 1917 to be present at the great annual meeting of the gods at Sultanpur, when all the gods from all the villages are brought in to pay homage to the great god Raghonathji and to one another. I thought I would stroll down to see what went on, but as the Lieutenant-Governor I was hauled up on to a dais before I knew what was intended, and was told that all the gods would march past and salute me, and I was to receive the salute. There was no way out of it. I felt tremendously honoured and also much embarrassed. All the gods of Kulu, preceded by Raghonathji, marched past and I returned their salute.

So far as regards Hindu Kulu. A few days afterwards I was going up the valley on the way up the Rohtang pass, and I met the Nono of Spiti, the head of the Buddhist religion. He is something like the Dalai Lama, and is the spiritual and (under Government) civil authority in this remote valley of Spiti. The previous Nono had died the year before, and the new Nono had been appointed by the Spiti College of Cardinals, and came in to receive investiture from the Lieutenant-Governor. I happened to meet him, very tired after his long journey over the pass, and we had a most pleasant interview, in which I gave him due recognition and increased his poor temporalities by giving him a larger share in the income of the Principality. It is only to-night that I have heard that his good fortune did not last long, and that he was succeeded by the boy we saw on the screen.

There is one little fact I might mention. Lahul is perhaps the most remote corner of British India, being 150 miles away from the nearest railway, and is only reached by the Rohtang pass about 14,000 feet high. I was there at the outbreak of the war, the echoes of which resounded as far as Lahul. The people of those parts are extremely peaceful; for generations they have had no fighting to do, but they knew the British Empire was at war, and that it was a time when the King-Emperor expected his people to rally to his assistance. At that time all our fighting forces in the Punjab were being drained dry. We had sent a quarter of a million combatants to the colours. The local Thakur or Rajah came to me in October 1916 and said, "Sahib, I am a

man of peace, but if necessary I am willing to fight." I said, "We are getting our fighting men from the plains." "But," he said, "how can I help?" I said, "At the present time the Government is very sadly in need of a Labour Corps in Mesopotamia," and I told him where it was; "but you would not be fit to go into Mesopotamia. You could not leave your snow-clad mountains and shady valley and go to the wastes of Mesopotamia." He replied, "Sahib, I am going. I will take two hundred of my men with me." He passed me his word, and before six weeks were over that man, at the beginning of the winter, that is to say in October, had left these tremendous heights and the snowy mountains and taken two hundred of his merry men with him and gone to work in the arid and sun-smitten wastes of Mesopotamia, to do his bit in the Great War. They remained for six months there, and did admirable work. Probably not more than two or three of that intrepid band had ever left their mountain passes before, yet for a great cause they risked everything. One might have heard of more showy deeds, but not of any more genuine testimony to the loyalty and spirit of these people in these remote mountain passes than that one single effort.

The PRESIDENT: Sir Louis Dane first went to Kulu in the year 1880, but there is a gentleman here to-night who was there a good many years before. I do not know whether Mr. Coldstream would like to corroborate what has been said about the beauties of Kulu.

Mr. W. COLDSTREAM: Of those who are present in this audience I am probably the first who was in that interesting land which the lecturer described. I was there as Assistant Commissioner in the year 1866. I found it a most interesting sphere of work in those days, and it has been a great pleasure to me to watch the development of Kulu. I hope that it may go on and flourish, and may have a great many as zealous and enterprising officers to carry on the administration as those whom you have seen on this platform to-night.

The PRESIDENT: I know that you will all wish me to thank our lecturer, Mr. Shuttleworth, for giving us a most vivid description of that wonderful and delightful land over which he ruled for a year or two; but especially for having brought back to us those photographs which have given us a very clear idea of the magnificence of the scenery.

THE EVIDENCE OF A TRUE NORTH AND SOUTH DIRECTIVE FORCE IN THE ATMOSPHERE

E. A. Reeves, Map Curator and Instructor in Surveying, R.G.S.

Read at the Afternoon Meeting of the Society, 15 *May* 1922

ABOUT four years ago, at one of the afternoon meetings of this Society I read a paper on "A Transformation of the Magnetic Dip Curves," * and at the end of the paper stated that I hoped on some future occasion to place before the meeting the results of experiments which I had been making for some time past in connection with the subject. These experiments were commenced about 1911 and have been continued ever since when possible, not only by myself in this country,

* Published in the *Geographical Journal* for March 1919.

racter of the electric field might be expected to reveal itself at high altitudes. The presence of ions in the atmosphere is an experimental fact. Any electric field would produce a convection current of these ions in their respective directions. If the aurora borealis could be viewed as such electric discharges, their parallelism to the lines of magnetic force would indicate the existence of an electric *dipole* field parallel to the Earth's magnetic field. The auroræ are generally explained as being due to streams of electrons or α particles from the sun. It is however remarkable that both solar "coronal," as well as the terrestrial "auroral" streamers, which are the origins and terminations of the streams, follow the lines of magnetic force when they should move at right angles to them. The agreement of direction of auroral streamers and lines of magnetic force is very close indeed. The difference is hardly more than $1^{\circ}{\cdot}27$ (L. Vegard, "Results of Northlight Investigations," etc., *Phil. Mag.*, 1921).

Slipher and Lord Rayleigh have found evidence of a permanent aurora, and that at quite low latitudes, by spectrograms. The question naturally arises here as to whether the direction of the auroral streamers is also parallel to the lines of magnetic force or at right angles to them.

For solar coronal streamers "following the magnetic lines of force in the neighbourhood of the equator," see Birkeland's experiments with magnetized-globe cathode (Figs. 247 *a* and 253).

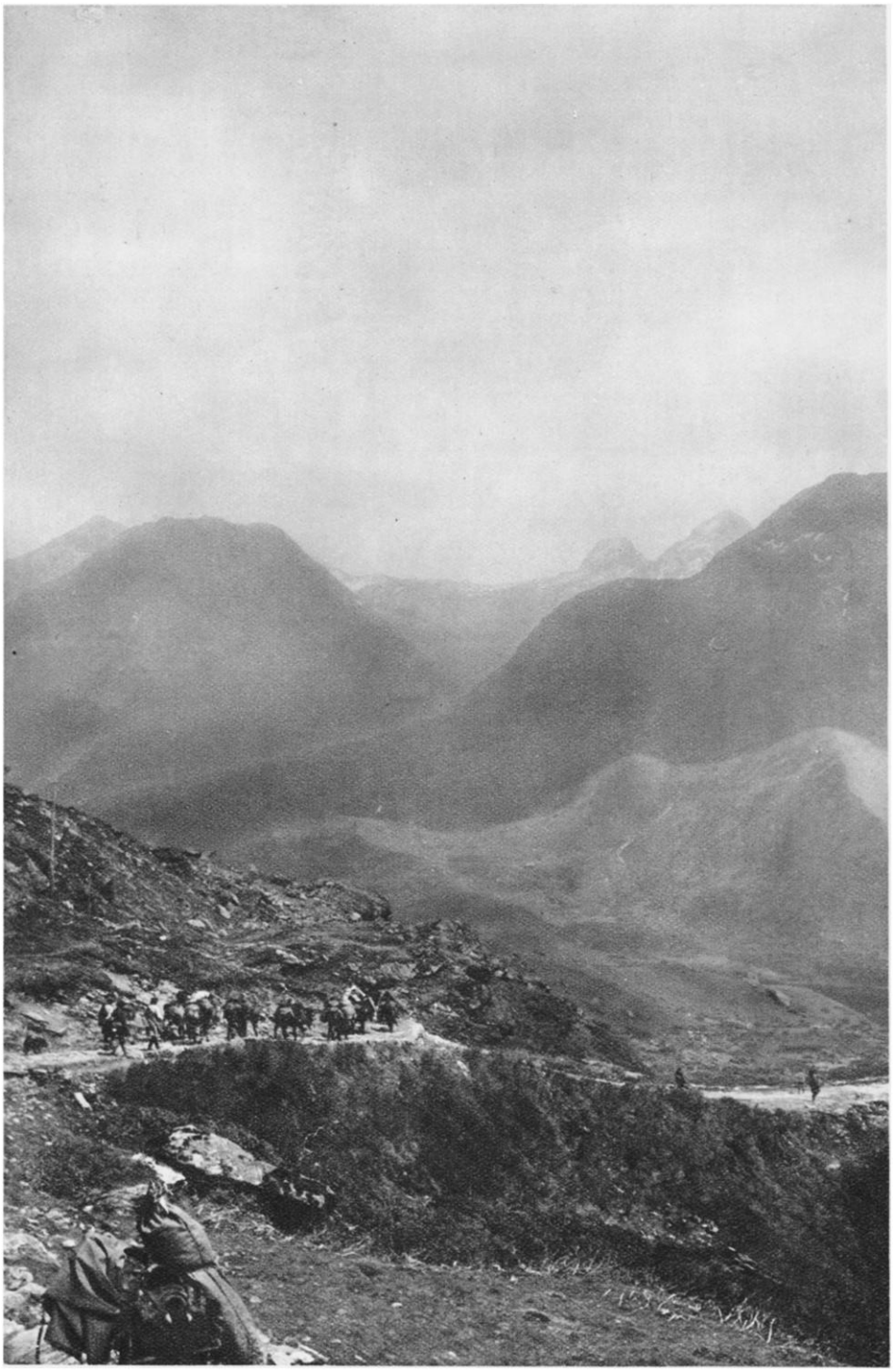
From such evidence the existence of a dipole electric field seems strongly indicated, and Reeves's experiments, repeated at Spitsbergen, Cameroons, Arizona, and other places, may be taken as demonstration of the horizontal component of the Earth's dipole electric field, specially when gravitational and magnetic explanations of the phenomenon have been recognized to be inadequate.

University College, London, 5 July 1922.

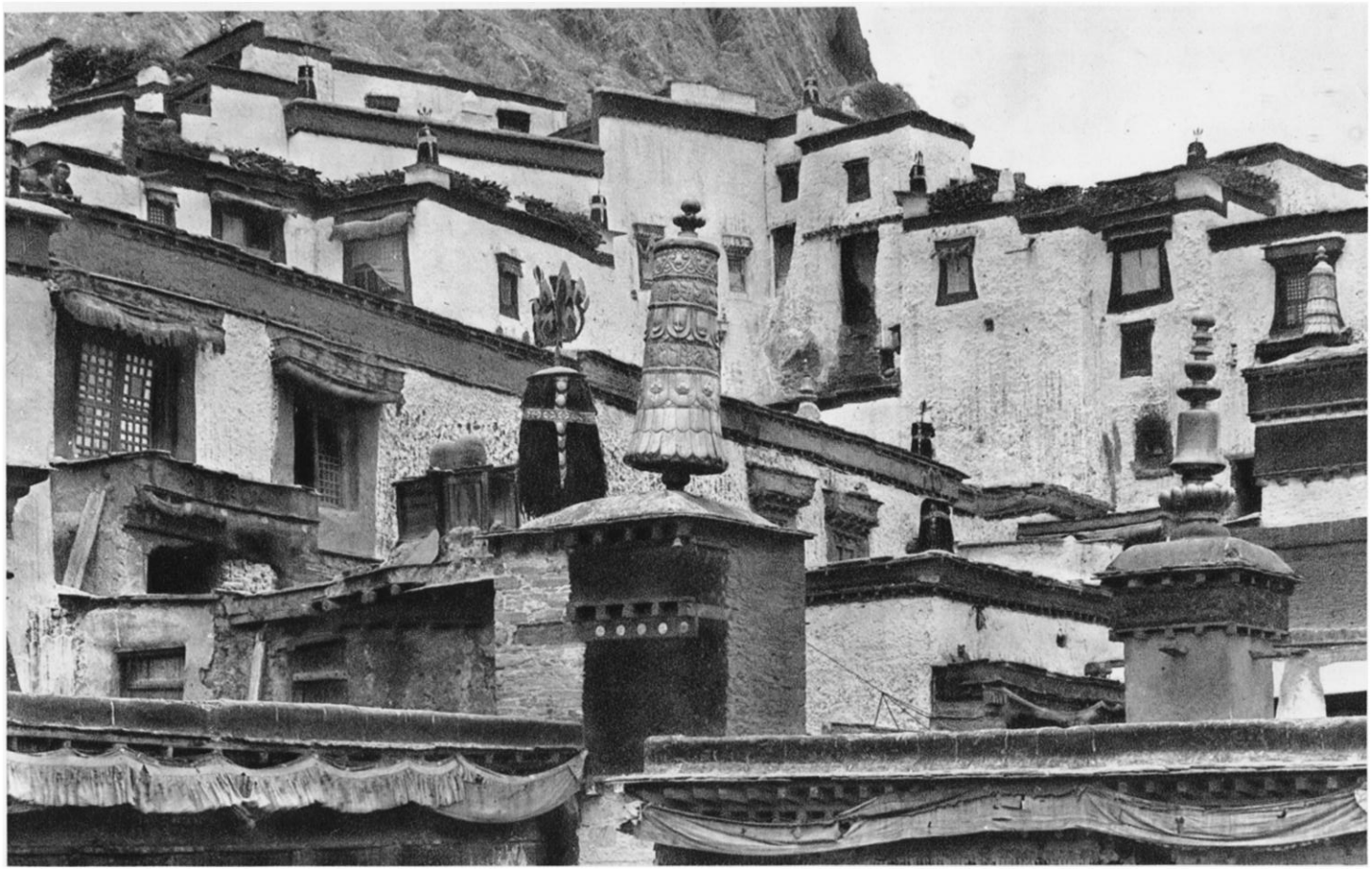
PHOTOGRAPHS FROM THE MOUNT EVEREST EXPEDITION

FROM the very large number of excellent negatives sent home by Captain Noel we have selected for reproduction a series which shall illustrate the *route* of this year's expedition without overlapping the photographic results obtained last year by Colonel Howard-Bury and Mr. Wollaston, of which three sets were reproduced in photogravure for the *Journal* of October and December 1921 and February 1922. Reference should be made to the maps published in the latter number, or to the photographic survey of Major Wheeler, of which two sheets have been received, the third, covering the west Rongbuk glacier and the Khombu Pass, being still awaited. Copies of this map may be seen in the Map Room, and a special edition over-printed with a red grid was provided by Colonel Ryder for use in the field this year: without however eliciting a single map reference in report, letter, or list of photographs!

The main body of the expedition was fortunate in finding the Jelap La nearly free of snow so early in the season; but the same heavy snowfall which caught them beyond Phari caught Captain Finch and Mr. Crawford on the pass: and there are in the collection many beautiful pictures of



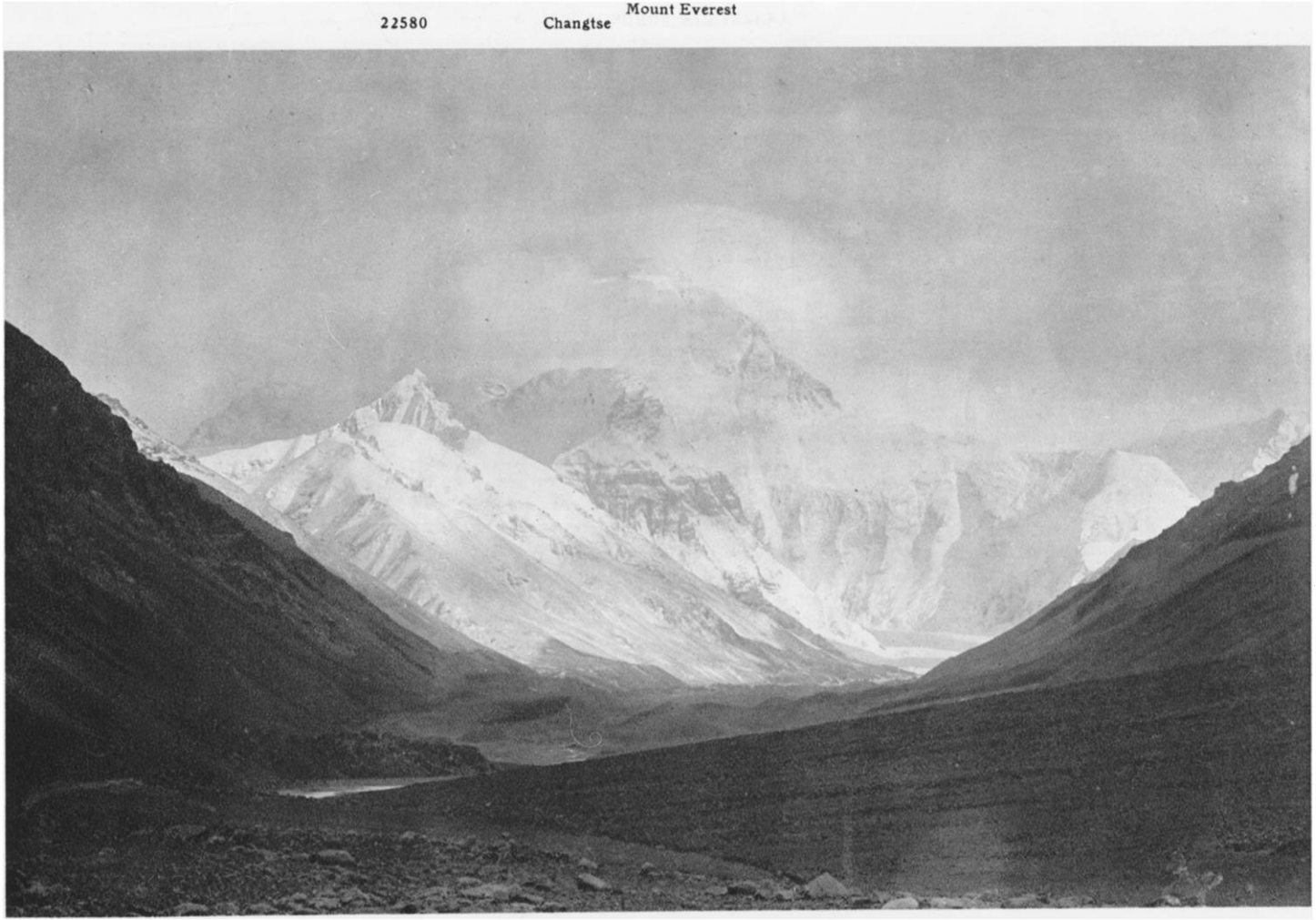
1. APPROACHING THE JELEP LA



2. SHEKAR MONASTERY FROM THE ROOF OF THE PRINCIPAL TEMPLE

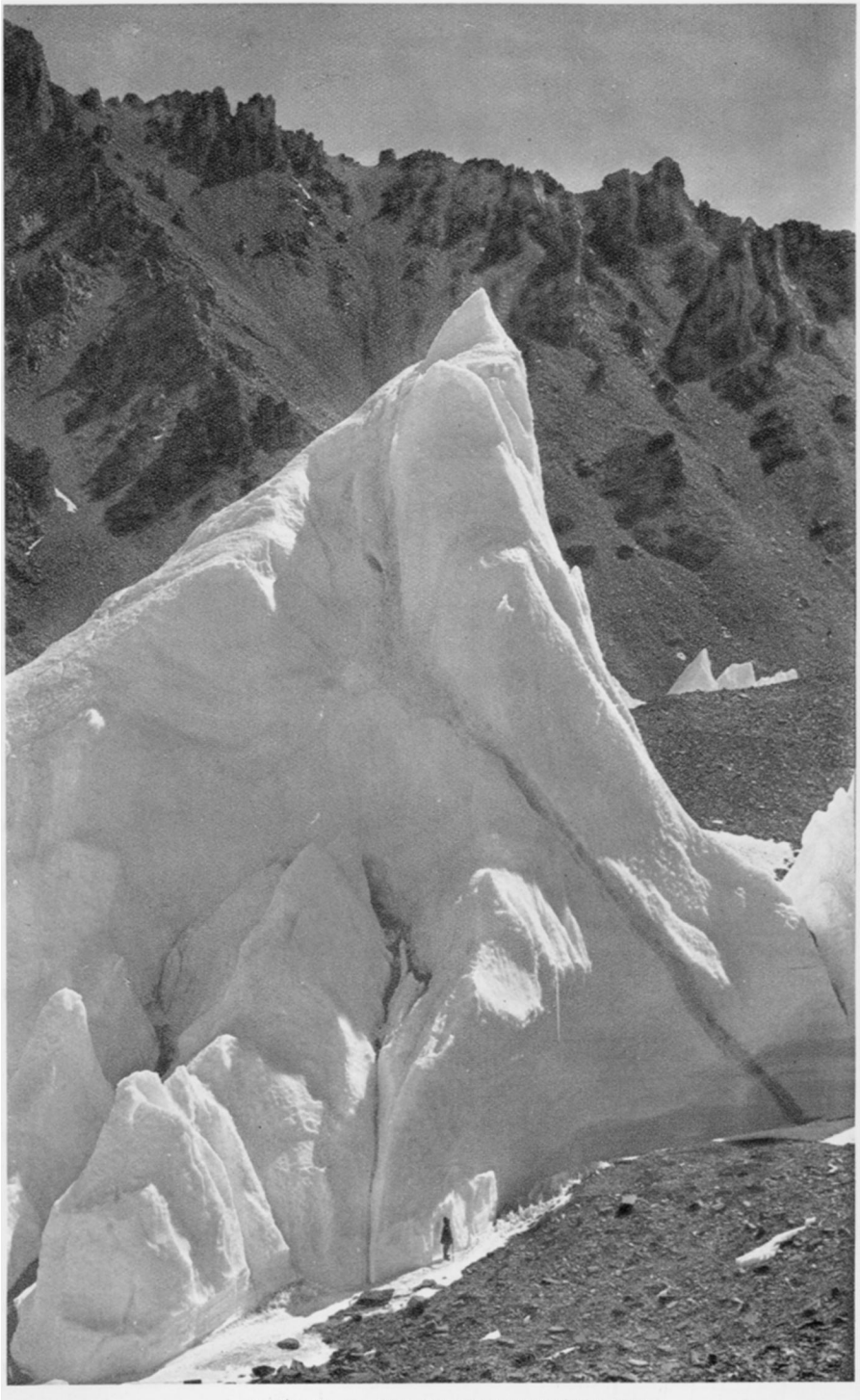
3. MOUNT EVEREST AND THE CHOMO LUNGMA GROUP FROM THE PASS SOUTH OF SHEKAR BETWEEN THE VALLEYS OF THE BHONG ĊHU AND THE DZĄKAR CHU

4. THE RONGBUK MONASTERY



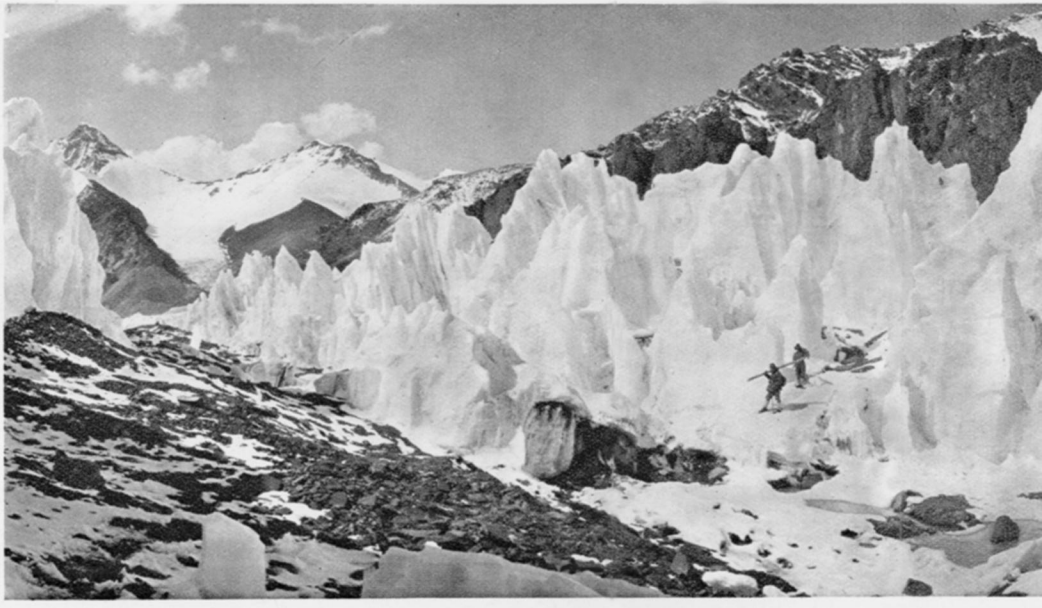
5. MOUNT EVEREST FROM THE RONGBUK VALLEY

6. THE BASE CAMP, RONGBUK VALLEY



7. SERAC ON THE EAST RONGBUK GLACIER

Photo. by Dr. Longstaff



8. EAST RONGBUK GLACIER BETWEEN

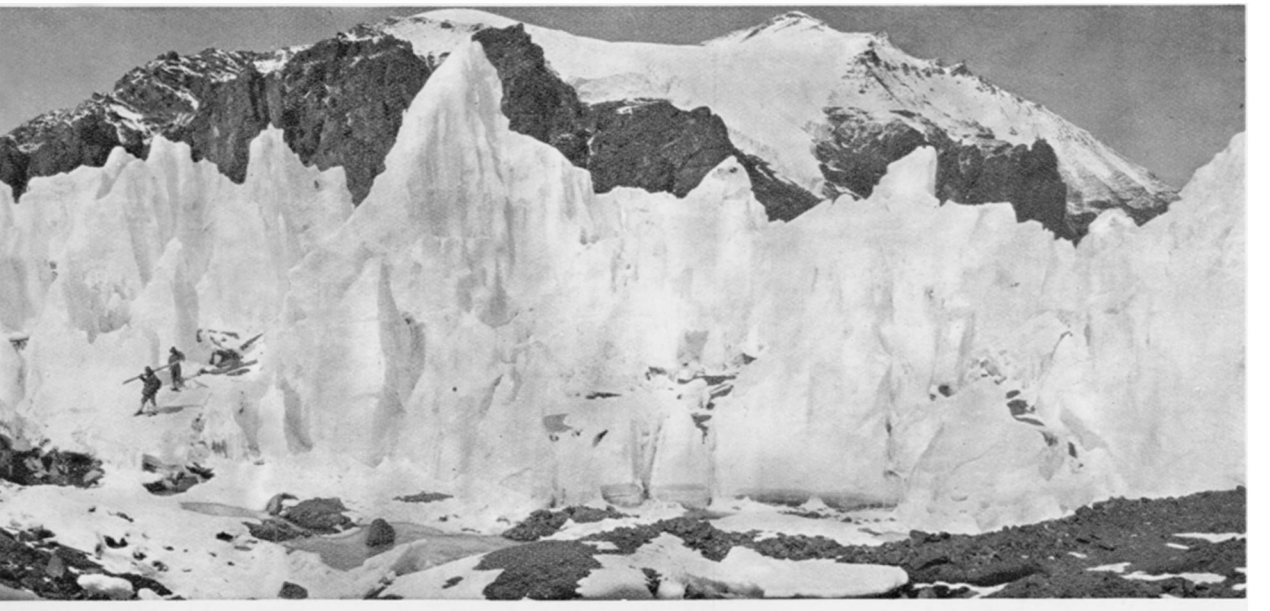
Chang La

Camp IV.

Changtse

9. HEAD OF THE EAST RONGBUK GLACIE

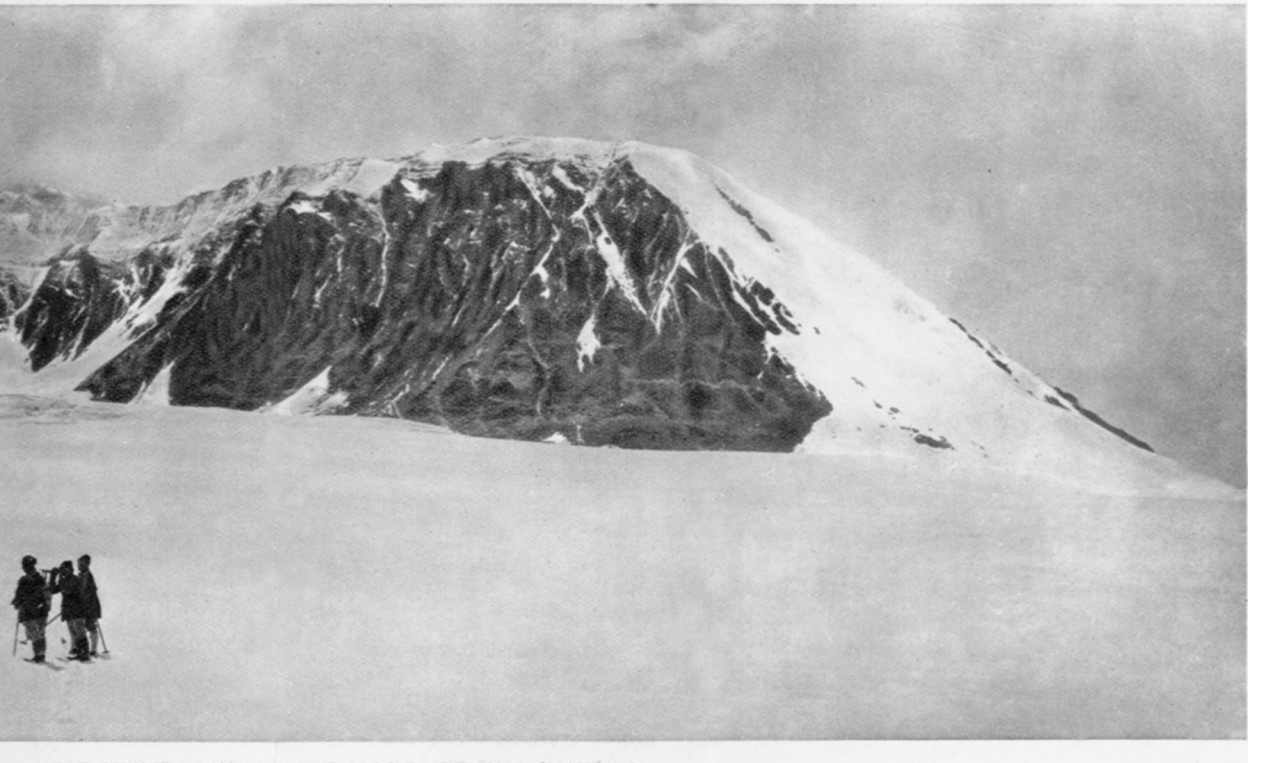
ongstaff



8. EAST RONGBUK GLACIER BETWEEN CAMPS II. AND III.

gtse

Camp III.



9. HEAD OF THE EAST RONGBUK GLACIER AND THE CHANG LA

23180 NORTH 22460 22740

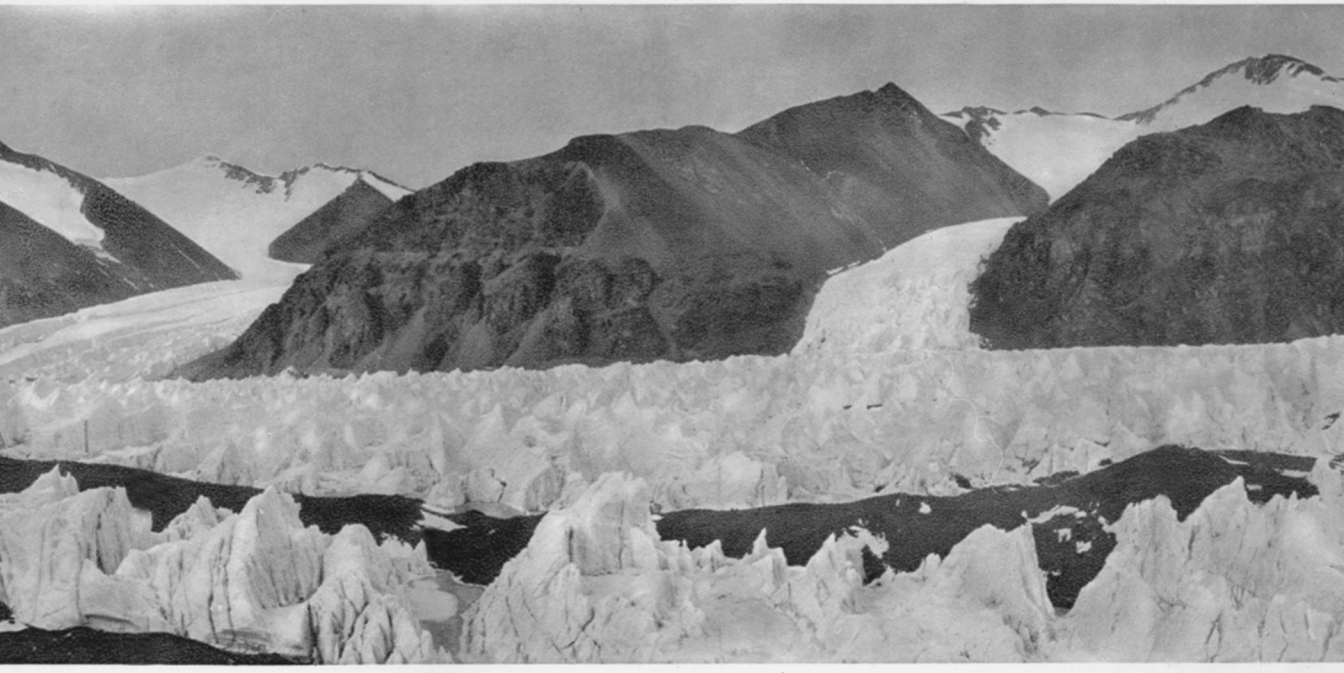
Camp II. 10. THE

Changtse

11. LOOK

22740

EAST ↓ Khartaphu 23640



10. THE EAST RONGBUK GLACIER FROM ABOVE CAMP II. (PANORAMA)

Khartaphu Lhakpa La

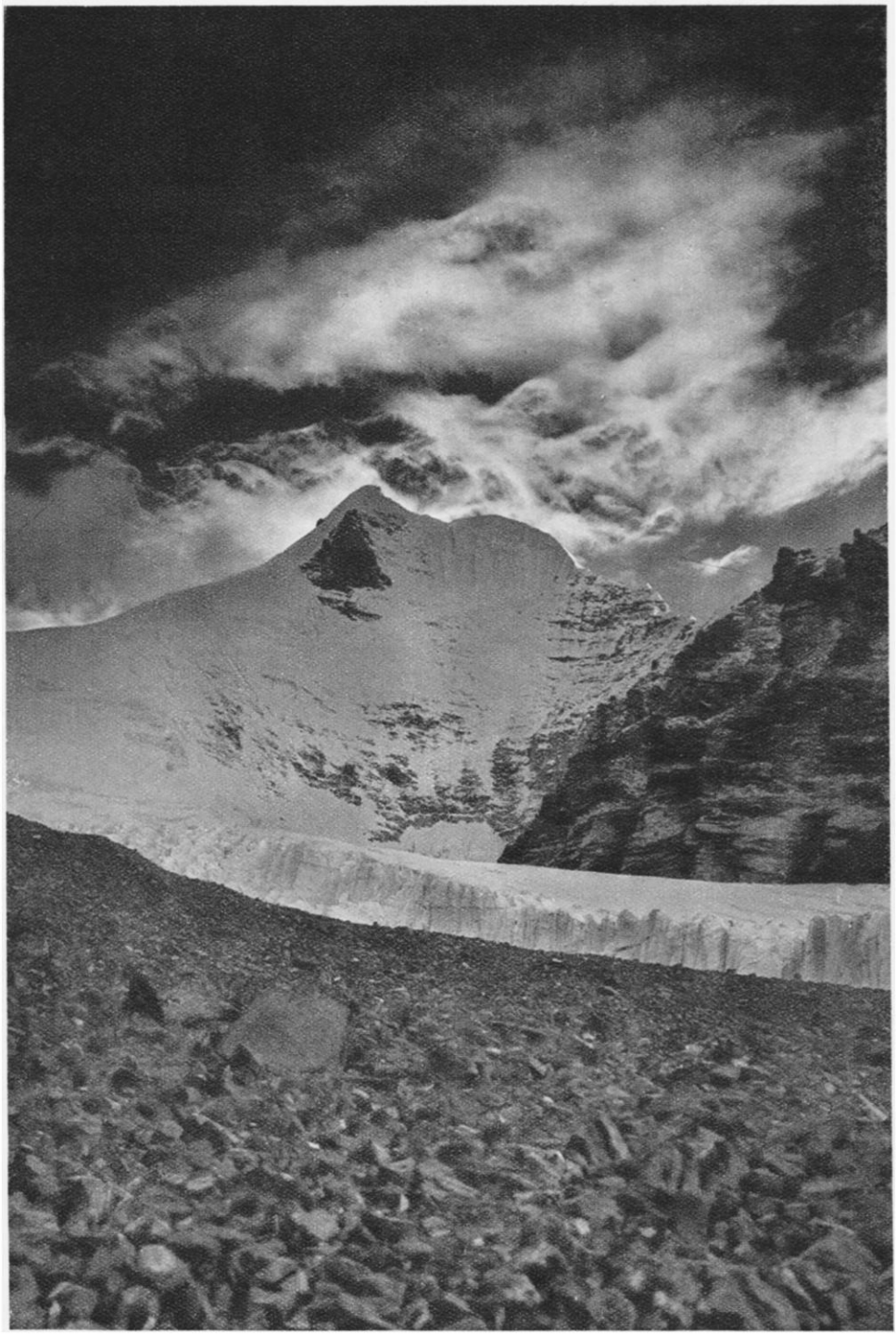
11. LOOKING DOWN THE EAST RONGBUK GLACIER FROM THE CHANG LA. Camp III.

EAST ↓ Khartaphu 23640 Rapiu La

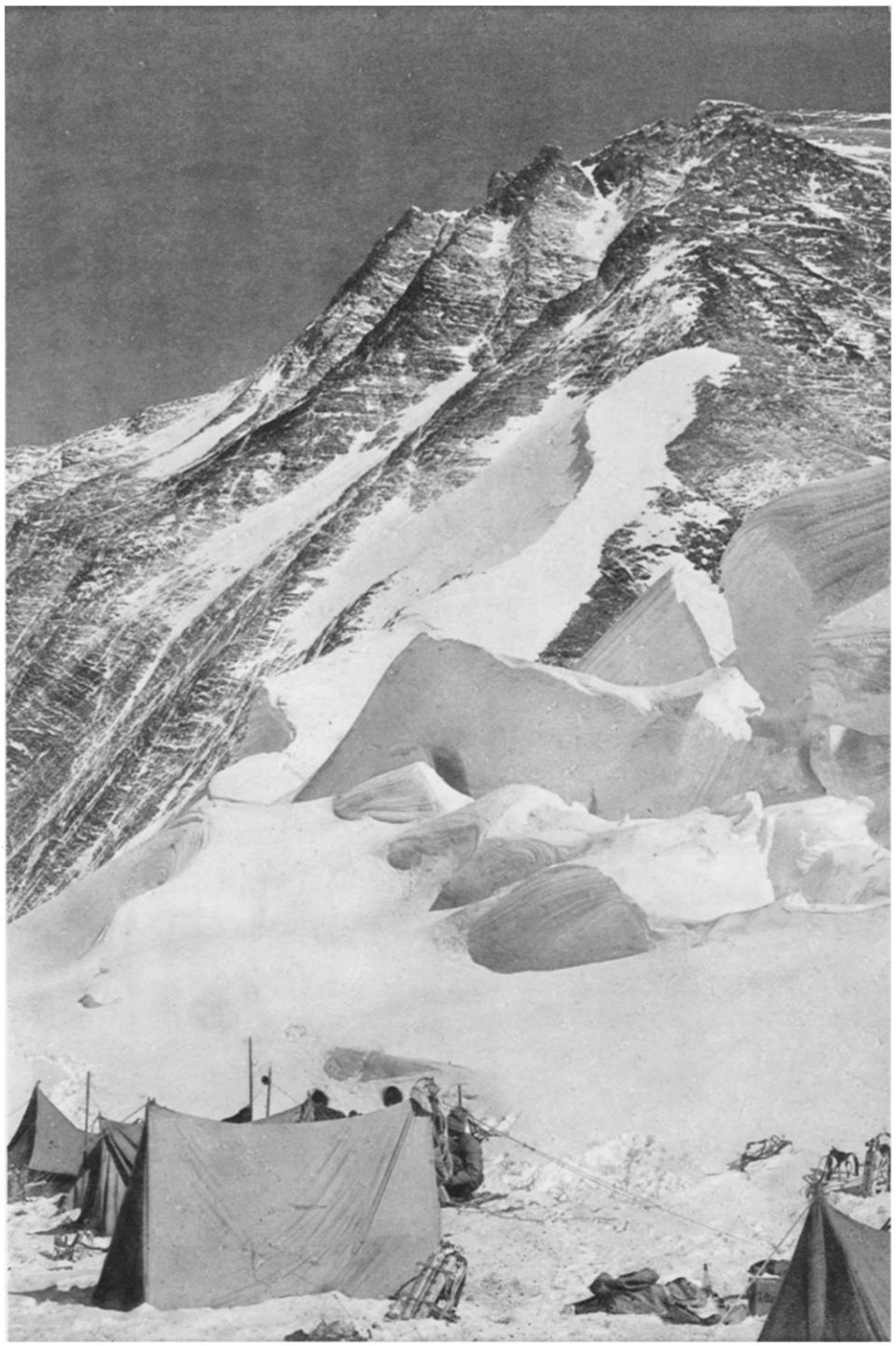
ORAMA)

Khartaphu Lhakpa La 22850

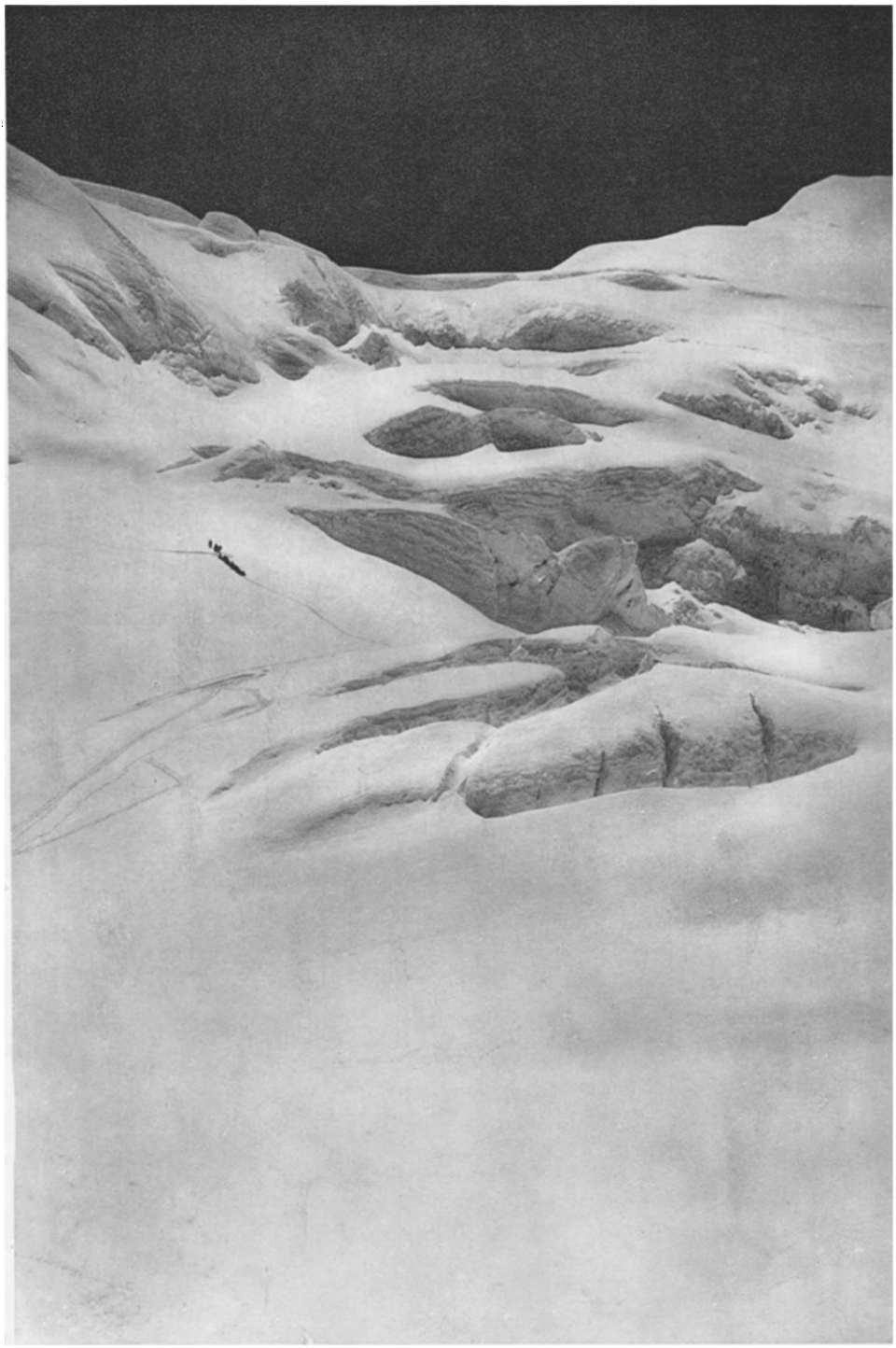
HANG LA. Camp III.



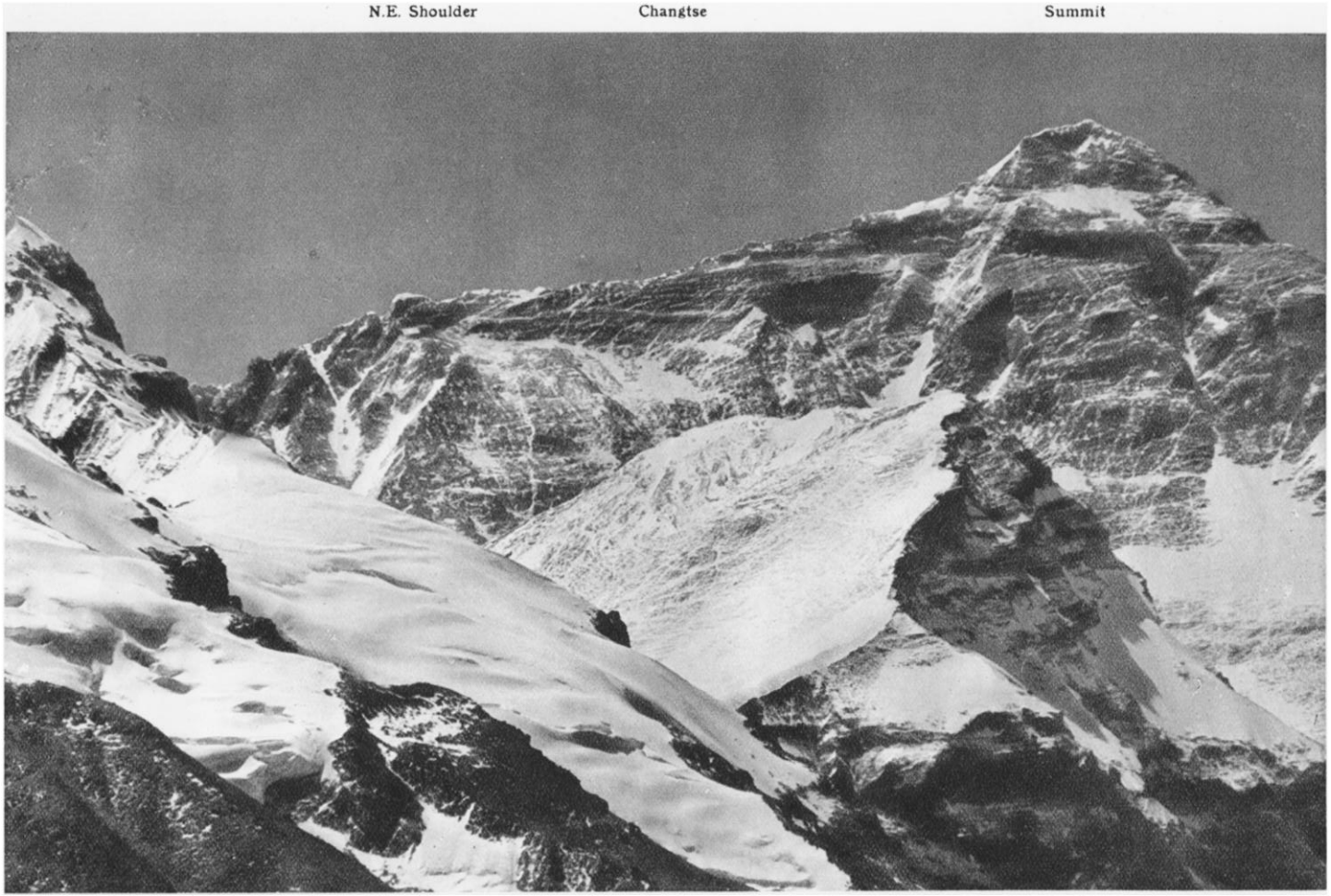
12. SUNSET FROM CAMP II.



14. THE NORTH-EAST SHOULDER AND NORTH ARÊTE FROM CAMP IV.



13. THE APPROACH TO THE CHANG LA



15. THE NORTHERN FACE OF MT. EVEREST (TELEPHOTOGRAPH FROM THE BASE CAMP)

the plains towards Kampa Dzong all snow-covered and exceedingly cold. It is certain that the expedition started this year at the earliest possible date.

They went by Shekar for convenience of transport, and to pay their respects to the Dzongpen in whose district they would be operating; and they obtained a whole series of beautiful pictures of Shekar town, monastery, and fort—enough to illustrate and to provide a monograph on Tibetan architecture. From Shekar they travelled almost due south across the Bhong Chu (Arun river), and so by a pass, which is not named on Major Morshead's map, from which there was a comprehensive view of Mount Everest and the Chomo Lungma group (Plate 3). This is an aspect different from anything that was obtained last year, and the picture will repay careful study and measurement, as soon as we can obtain from Captain Noel the focal length with which it was taken. The deep valley in the foreground is that of the Dzakar Chu about Namda. Here the expedition turned a little westward and reached the Rongbuk valley by a way somewhere in the right of the picture. The valley in the middle distance, below the first snows, is that leading to the Doya La by which one gets to Kharta. We are looking from a little east of north; the main Rongbuk valley runs rather west of north, and so is not clearly seen in this picture.

Plate 4 shows the Rongbuk monastery, well up the valley, and only a few miles below the snout of the main glacier. Last year this monastery, curiously enough, was little mentioned and not photographed, and we were hardly prepared for the considerable part it has played in this year's expedition. The chief Lama received the General and his party with great ceremony, realized that it was the sacred duty of this Society and the Alpine Club to visit the most celebrated mountain, and gave his blessing to the porters and coolies. The friendly relations and sympathetic interest thus established were of the greatest importance to this year's and to any future expedition, for it was a veritable invasion of the usually silent, bare, and by nature inhospitable valley, without supplies, without fuel, and remote from the passes into Nepal by which Kharta and the Kama valley can be supplied.

The main camp was pitched a little above the monastery and below the glacier moraine, in the foreground of picture 5, which shows the entrance to the East Rongbuk valley just beyond the dark hill on the left, and in front of peak 22,580. Camp I. was established just round the corner here, on the left bank of the tributary stream, and above this camp began the struggle with the excessively awkward East Rongbuk glacier. The only knowledge we had last year of this glacier was derived from Major Wheeler's photographs and account: and there was little in these to prepare one for the fantastic scenes about Camp II., shown in pictures 7, 8, 10, and 12. The tributary glacier coming down from peak 22,580 (Plate 12) is bordered by an ice-cliff near 100 feet high: the

seracs on the main glacier are of the same order of height, as may be seen on comparison with the small figure shown in Plate 7. And from the slight accounts we have of the last days on the glacier, when the camps were being evacuated after the monsoon had broken, it would seem that this fantastic ice structure alters very rapidly each summer. What a field it would be for stereographic survey of glacier movement!

The small party who came last year to the head of this glacier from the Kharta valley over the Lhakpa La, missed all the exciting stage between Camps II. and III., and encountered only the relatively easy surfaces shown in Plates 9 and 11, up to the foot of the Chang La. They made no special reference to difficulties in the ascent, and took no photographs from close at hand: also they were dealing with much deeper snow, after the monsoon. Plates 9 and 13 show that the route is formidable, beset with crevasses and ice-cliffs on a scale which seems at first sight out of proportion to the relatively small catchment area and the very thin covering of the mountain. For the mountain before the monsoon is mostly bare rock (Plates 14 and 15), but the dip of the strata is toward the north, and the slabs are therefore tilted in such a way that they are very dangerous when thinly covered with snow.

The last picture (No. 15) is one of a pair taken near the base camp with a telephoto lens, on a base of about 160 yards. The pair give an excellent stereoscopic combination, bringing out the structure of the northern face excellently, though it is about 12 miles away. The pictures can be seen in the stereoscope in the Society's Map Room. In examining these photographs one must remember that the telephoto lens often gives curious perspectives: see, for example, Plate 12 in the February *Journal*, where the walls of the great cirque seem to be flattened up against the north-east shoulder of the mountain; also that the camera was a good deal tilted up, so that, although the picture was taken from 16,500 feet, the spectator seems to be nearly level with the summit of Changtse (24,730), which, it should be noted, is not the point at the end of the long ridge leading away from the camera, but is the rounded dome further back and to the left, or perhaps even beyond this. The first climb reached a point about 450 feet below the north-east shoulder; the second, by a long traverse across the north face, reached about the snow-patch to the left of the big black mark, just over Changtse.

True heights by aneroid have been checked by theodolite observations (incomplete owing to persistent bad weather) made by Major Norton and computed by Major Morshead. They confirm very well the aneroid heights for Finch and Bruce, and suggest that the Mallory party went somewhat higher than they estimated, very nearly 27,000 feet. We hope to publish later a full discussion of the height determinations, when all the details have been received from India.

Major Norton has returned in good health, but has lost by frostbite a small piece of his right ear. Major Morshead writes that his frostbitten

hand is doing better than was expected, and he may lose only one finger-tip. Dr. Wakefield will be home before the end of September, and General Bruce early in October. Captain Noel is expected in London the day before the joint meeting at the Central Hall on October 16, at which all the members of the expedition who went out from England will be present except perhaps Mr. Somervell.

The greater part of the collections have now been received. About 400 specimens of pressed flowers have been sent to Kew for identification, and the roots of two different primulas which it is hoped may have survived the journey. A small collection of insects and reptiles, and a few birds and mammals, are being examined at the Natural History Museum. The geological specimens, after examination by Dr. Heron, are on their way home. We understand that Mr. Somervell has made a large number of sketches, and has also recorded the music of many Tibetan songs. Captain Noel, when he wrote last from Gyantse, had obtained excellent films of Tibetan life and of Lama ceremonial.

General Bruce has reported to the Mount Everest Committee that suitable provision has been made for the families of the seven Nepalese porters unhappily lost in the third attempt. The Commissioner at Darjeeling has very kindly undertaken the monthly payment of the allowances, on behalf of the Committee.

THE INTERNATIONAL GEOGRAPHICAL UNION

AT a Conference held in London in October 1918, between representatives of the Academies of Science of the principal Allied Powers, it was resolved that the nations at war with the Central Powers should as soon as possible denounce the conventions governing International Scientific Associations, and should form new scientific associations for international co-operation, with the eventual concurrence of the Neutral Powers. To this end an International Research Council was organized at Brussels in 1919 by representatives of the Principal Allied and Associated Powers, and to this Council the neutral nations, Spain, Holland, Sweden, Norway, Denmark, and Switzerland have since adhered.

A principal object of the International Research Council is to promote the formation of International Unions in the different sciences or groups of sciences. When a new Union is proposed, the first step is to form in each country a National Committee for that science, under the auspices of the National Academy of the country. When, therefore, it was proposed by certain French and Belgian delegates to the first General Assembly of the Council that an International Geographical Union should be formed, the Royal Society consulted the Conjoint Board of Scientific Societies, and on its recommendation constituted a National Committee

The Geographical Journal

Vol. LX No. 6 December 1922

THE MOUNT EVEREST EXPEDITION OF 1922

Read at the Joint Meeting of the Society and the Alpine Club, 16 October 1922. Map follows p. 452.

I. DARJEELING TO THE RONGBUK GLACIER BASE CAMP

Brig.-General the Hon. C. G. Bruce, C.B., Chief of the Expedition

ABOUT the beginning of the last week in March the whole of the members of the Mount Everest Expedition collected at Darjeeling. Previous to this the Staff of the Expedition had been in Darjeeling for nearly a month to make all the necessary arrangements, select the porters, and to receive from Calcutta the large amount of supplies which had been previously forwarded from England. On our arrival we found that our agent, Mr. Weatherall, had carried out the directions which we had previously sent him in the most efficient possible manner. Not only had he our large stocks of local supplies, grain, etc., all ready for transport and beautifully packed, but he had collected from the surrounding district at least 150 Bhotias and Sherpas from whom we could select our porters. He had also a large selection of cooks ready for us to choose from. All stores, as they were received in Calcutta, were forwarded by the Army and Navy Stores direct to Kalimpong Road, where they were received by one of our transport officers, Captain Morris, handed over to the contractors who had undertaken the transport of the Expedition, and forwarded by them with the greatest possible speed to Phari Dzong. Naturally this took a good deal of arranging, as the stores arrived in no less than four different consignments, the last consignment of all, the oxygen cylinders, actually arriving in Calcutta on or about the date that the Expedition left Darjeeling. Luckily, owing to the first-rate arrangements made for all the clearing and forwarding of our stores, there was no delay on the arrival of the ship in getting the oxygen to Kalimpong Road.

Although we had a great deal of work to do in Darjeeling itself, it was really most interesting. The selection of coolies alone was of great interest. We chose seventy-five of the best men we could find; they were put into the hospital for three days to be under the observation of the civil surgeon; the pick of them were re-selected on his report. We also had to select an interpreter, and we found a most excellent youth in

the person of Karma Paul, a Christian Tibetan. He was a lad who had done no work for Government previous to our engagement, and was rather a simple person filled with a quaint little vanity of his own. His one idea in coming with the Expedition, beyond the fact that he wished to travel in Tibet, was to get a good report from it with a view to permanent employment afterwards. He was very light-hearted in his outlook. When he was Karma he was a Buddhist, and received blessings from every Lama he could get near to. When he was Paul he was a Christian. Otherwise he did very well for us, and never lost his keenness right to the very end of the expedition. There was also the sardar who was employed by last year's Expedition. On this occasion he played up and did very well right through the expedition. However, a great number of his duties as sardar were unnecessary, as they were much more easily carried out by the officers of the Expedition themselves. He went as general utility man to a large extent, but was also in charge as sardar of Col. Strutt's party when they returned post-haste from Rongbuk to Darjeeling in June, and on that occasion he received a first-rate report, both from Col. Strutt and Dr. Longstaff. By this it must not be thought that he was a saint. Among his many backslidings he committed two sins of the first class; for one of which there was some excuse, for the second of which there was absolutely none. The first crime consisted in his having poisoned a well-known Lama at the head of the Dud Kosi. The second —an entirely unforgivable crime—was that he lost my ice-axe within four days of leaving Darjeeling.

Among the other followers of the Expedition were the cooks, a most important part. Having fixed on the men we thought were the most likely, my cousin and I took them out into the mountains and tested them as well as we could. I do not think there was any complaint whatever by any member of the expedition of the behaviour of the cooks, as will be seen later on, nor, under the conditions, of the quality of the food they gave us to eat; in fact, they were quite a feature.

We also provided ourselves with a cobbler; this cobbler has, I think, probably the distinction of being the absolutely thickest-headed person that I have ever met during the whole of my service in India. He did very well considering, his only complaint being towards the end that if he had known what was in front of him he would never have come. We had also a most excellent servant of the expedition called Chongay, whose first duty was the charge of the tents and stores. He did excellent service, and was ready to turn his hand to anything. A Lepcha plant collector was added to our personnel, and I must not forget to say that, owing to the kindness of the Commander-in-Chief in India, Lord Rawlinson, we had four young non-commissioned officers of the 2/6th Gurkhas attached to the expedition.

Before leaving Darjeeling we received a permit from the Dalai Lama authorizing us to travel in Tibet, and directing all his officers to give us

every possible assistance. As the permit mentions Mount Everest by name, I think now is the time to again refer to the name of the mountain. If you will look at the permit you will see that it is quite clearly called Chha-ma-lung-mo. Working this out I found that the Sherpas from the southern face of the Himalaya call the mountain by the name which I had got for it in 1909—Chho-mo-lung-mo, "the abode of the goddess"—which was confirmed afterwards by Dr. Kellas, and later by last year's Expedition; whereas on the north it is known by the name by which it is called in the Dalai Lama's permit. Chha-ma-lung-mo has been translated to me by Mr. Macdonald, the Trade Agent at Yatung, in two ways: first, as "the place of the female eagle," and secondly, as "the place where it is so high that even a bird goes blind when he gets there." I think we can take it that both names—with the small but important difference in the vowels—are in ordinary use.

Before we left Darjeeling, by invitation of the Buddhist Association and the Hillmen Association, all the members of the Expedition, including every one down to the cobbler, were entertained by these two Associations, and there, after much speech-making, we all received the blessing of the local Lamas and Brahmins. This gave the porters a particularly good send-off, and it is possible that their wonderful behaviour owed something to this stimulation. The Gurkha N.C.O.'s were doubly fortified, as they took blessings from both the Lamas and Brahmins, as also did the European members of the party.

A great gratification was a most kind telegram received from His Holiness the Pope just as the expedition was leaving Darjeeling; in fact, I think it arrived the actual day we took train. The telegram was as follows: "May God who lives in the heights bless the expedition."

By the kindness of the Himalayan Railway, the remaining heavy baggage and members of the party were moved round from Darjeeling to Kalimpong Road free. We all went round the Teesta valley in the normal manner, with the exception of Captain Noel, who elected to ride on the roof of the train with his cinema-camera and take records of that wonderful place. The valley could not really do itself justice, as we had had no less than a full month of fine weather, and the hot-weather haze rather obscured and belittled the scenery, besides tending to dry up the gorgeous tropical vegetation and jungle.

From Kalimpong the party broke into two for our journey to Phari Dzong in Tibet. On the whole we had a very comfortable march indeed through Sikkim and over the Jelep La to Chumbi, though we ran into rather rough weather from Gnatong for a march and a half over the pass. We also made acquaintance with the wonderful Chumbi mule transport. These mule-men work regularly seven months in the year carrying wool from Tibet down to Kalimpong, and they thoroughly understand the art of loading and travelling the mules. Not only that, but they march at the most astounding pace. The continual hard labour, I am afraid,

rather makes sore backs, but this is also largely due to the enormous and continual ascents and descents between a very cold climate and a very warm one.

The march through Sikkim in fine weather is, at any rate, a wonderful experience. After the very deep tropical valleys, it is very strange to emerge at Gnatong into what one might almost describe as uplands, from which more or less minor peaks rise, the whole country giving one quite an impression of the Scottish highlands in spring, both from the colouring and from the amount of snow on the mountains themselves. In the Western Himalaya snow lies many feet deep right into May down to a height of 11,000 feet, or even below, but here at the end of March we were troubled in no way by deep snow, and many of the peaks up to 15,000 feet appeared to be almost clear of winter snow. Most of the great amount of moisture deposited on these ranges falls during the summer months, the winter months being comparatively dry.

The descent into Chumbi, as it always is, was very striking. One leaves Sikkim behind and enters a valley which reminds one much more of the west than of the east. At Chumbi itself we were entertained by the Trade Agent, Mr. Macdonald, who accompanied us afterwards up to Phari Dzong. The road from Chumbi to Phari Dzong is again rather different in type, but quite beautiful in its way, and as wild as it is possible to make a forested gorge. It is very striking, emerging from the black and forested gorge of the Ammo Chu (the Chumbi river) on to the bare plateaux of Tibet.

When we were crossing the Jelep La we got a first-rate view of Chomolhari, which is 23,800 feet high, and stands right over the fort of Phari Dzong. It shot up into the air, doing full justice to its real height, and looked enormous. I collected the members of the Expedition who were with me, and I said, in order to encourage them, pointing to the top of Chomolhari: "Your advanced base camp will be very nearly as high as the top of that mountain over there." This seemed to amuse them very much, especially as there were great streamers of snow blowing off the summit.

On arrival in Phari we found all our stores collected, and also the whole of our tents pitched and mended by our excellent tindel Chongay, who had gone on before. The chief business we had to do at Phari was making our first contract for moving our enormous collection of stores by the local transport. Early in the year all Tibetan animals are in very poor condition, and it was apparent that this must be so. Everything was frozen up and dried, and it is a wonder how the animals themselves manage to keep alive at all on the amount of grass to be seen on the hill-side. However, we finally arranged to move from Phari in two days, but we were also obliged to take with us 50 of the Chumbi mules to complete the transport required. Ultimately our transport consisted of some 320 mules, yaks, cows, and donkeys, eked out with 15 or 20 coolies.

In order to save time we had determined to go by the short cut to Kampa Dzong, and contracted with the Dzongpens to get there in four days with 100 animals, 50 of whom were the Chumbi mules, and it was the greatest possible luck for us that we were able to take these same 50 mules. Two hundred yaks were to arrive in Kampa Dzong in six days, and we arranged for them to march with the sardar Gyaljen and two of the Gurhka non-commissioned officers, Hurke Gurung and Lal Sing Gurung, the other two N.C.O.'s being in charge of the treasure chests and marching with the advance party.

We all now collected in Phari with the exception of Mr. Crawford and Captain Finch, who remained behind at Kalimpong to bring on the oxygen. We left Phari on the morning of April 8 in bad weather, which very rapidly degenerated, until the wind was blowing half a hurricane and it was snowing very heavily. After a most unpleasant march of 16 to 17 miles we managed to make a camp, and it was here that we found the great advantage of having kept 50 of our Chumbi mules. The rest of the animals with the advance party drifted in up to ten o'clock at night. The camp was deep in snow, and the cold was rather severe. This was not exactly an encouraging entry to Tibetan travel.

The following day was a really magnificent march, but exceedingly trying. The wind was very high, but the weather perfect in other ways. The road led us over three great ridges, all being part of a great northerly ridge running from the northern slopes of Pawhunri, all these ridges being 17,000 feet above the sea, more or less. It was an exceedingly cold march, and very trying to men and animals. We finally camped under some small cliffs at a place called Hung Zung Tak; animals not arriving again many of them until ten o'clock at night, but the position was saved by our 50 Chumbi mules. We waited the next day, as the animals were completely tired out. This was partly due to the fact that owing to the snow at the last camp there had been a minimum amount of grazing and rest for the animals. The men, too, required cooked food, as no fuel of any kind was available at the previous camp. It was a good test of the stamina of the porters, none of whom suffered, although three on the second march who had stayed behind were benighted and stayed out all night just as they were, without bedding, being retrieved the following day perfectly happy. The running stream by our camp was frozen absolutely solid during the night.

On April 11 we marched to Kampa Dzong, leaving the nunnery of Tatsang on our right, and on our way passing through a great quantity of game. At Kampa Dzong we halted three days owing to difficulty in collecting such an immense mass of transport, and we were joined by Captain Finch and Mr. Crawford, who had had a very rough time crossing the Jelep. The blizzard which caught us on our visit to Phari had caught them on the Jelep, and so heavy had been the snow that it had lain 6 inches deep at Yatung and Chumbi, which are only 9800 feet above the sea.

Every member of the Expedition was provided with a riding-pony, as it was found that continuous walking without rest on these heights was likely not to improve the condition but to exhaust, whereas a mixture of riding and walking would gradually acclimatize and bring them into training. We were most particular also to see that all our porters were well clad and warm at night and well fed, and whenever possible we added to their ration allowance by buying them meat and any other local comforts that could be found.

From Kampa Dzong our road led us *viâ* the fort of Tinki to Shekar Dzong, and this, being over the same country as was travelled last year, requires no particular description. Shekar Dzong is most wonderfully situated and very striking as one approaches it. Shekar, I believe, means "shining glass," and from the white exterior of the forts and town situated on the brown slopes of the mountain it is a very suitable name. At Shekar we found an enormous number of lamas, and I think that the priests were even dirtier, if possible, than at Phari Dzong. If you happen to smack a young lama friendly on the back, say, a flake of dirt falls off. They are perfectly astonishing in their dirt. This, however, does not apply to the Dzongpens or others of position, for in this part of Tibet the Dzongpens wash on New Year's night, and I think—I think—their wives do also.

From Shekar our road led across the Arun *viâ* the Pangla La down into the valley of the Dzakar Chu, thence following that valley up to the Rongbuk monastery in the Rongbuk valley.

Our last march up the Dzakar Chu into the Rongbuk valley was exceedingly interesting. The valley itself is deadly bare and barren, and the mountains are great horrible humps with nothing on them. One suddenly arrives where the valley opens on to the Rongbuk monastery. It is wonderfully new and clean for a Tibetan monastery, and even its lamas in this respect take after the monastery. The Head Lama of Rongbuk was a very interesting character. He is of extreme sanctity, and pilgrimages are made to his monastery; and further, the Dalai Lama visits the Rongbuk monastery yearly by proxy. The Lama of Rongbuk has the distinction of being an incarnation, not of Buddha, but of a god, the God Chongraysay, who owns no fewer than nine faces, and this particular lama himself is reputed to be able to change his face as he likes. He received us extremely well, and was a most striking and interesting old gentleman with perfect manners and perfect courtesy—far the finest type that we had yet struck. Of course there was the usual Tibetan tea. This is most appalling, having butter, generally rancid, salt, and other ingredients added, and the whole churned up before being served.

There is a local belief—or possibly even more than local, as we found it in the Chumbi valley equally—that many years ago during a previous incarnation this lama was challenged by a Pembo lama, who was also a magician, to race to the top of Mount Everest; the lama having agreed, the Pembo lama jumped on his magic drum and, beating it for all he was

worth, started off on the drum to the top of the mountain. After the Pembo lama had nearly reached the top the followers of the Rongbuk lama suggested his starting. Just then the sun rose; the Rongbuk lama, leaping on a ray, was carried to the summit in triumph.

The Rongbuk lama was very anxious to know what was the reason for all the trouble we were taking to explore Mount Everest. I thought that my best way to explain it was that we treated the expedition as a pilgrimage, and that it was an attempt to reach the highest point of the Earth as being the nearest to Heaven. This point of view was accepted. I added also, with a view to my own comfort, that I had registered a vow never to touch butter until I arrived on the summit. I dislike butter at any time, and Tibetan tea was absolutely the limit. From that time on I drank it without sugar or milk. We took the opportunity here of having our men blessed.

From the Rongbuk monastery the whole southern end of the valley is filled by Mount Everest. In a way this particular view is very striking, but I personally regretted the presence of those horrible humps which form the Rongbuk valley. In my opinion they belittle and, if possible, bemean the great mountain range, besides committing the obvious crime of shutting out the gorgeous mountains to its right and left.

We hoped to be able to push on and take the whole of our heavy luggage beyond the snout of the Rongbuk glacier, but our transport would have none of it, and rightly so; halting here we established our base at a height of 16,500 feet and collected our full stores, and a very imposing mass they made. Owing to the work of the reconnaissance of 1921 and to the fine survey carried out by Major Morshead and Major Wheeler, we knew now fairly well the line of our advance. From Wheeler's map it was quite apparent that our line must be up the East Rongbuk glacier, but a detailed reconnaissance had to be carried out in order that we could lay out a series of camps and make an advance base before attacking the mountain. Therefore, while the staff of the Expedition was establishing the base camp and Captain Finch was getting his oxygen apparatus into order, Colonel Strutt, Dr. Longstaff, Major Morshead, and Major Norton started out to make full reconnaissance of the East Rongbuk glacier. It was quite apparent that the work of establishing the camps and of making a further advanced mountaineering base on the Chang La would be very severe indeed. On these camps being fully rationed, fully provisioned, and supplied with fuel, would depend the success of the attack on the mountain itself. Evidently there was an enormous amount of stuff to be moved, and it was also apparent that, owing to the very short time at our disposal, none must be lost. Moreover, to employ our own porters in moving the stores themselves would not only take a long time but would greatly exhaust the porters, and then they would not be near their full strength for moving camps as high as possible on the mountain. We had very carefully looked after these

men, and it would have been poor economy to overwork them before it was necessary.

I do not think that I have explained that the whole problem of climbing Mount Everest was one of pace. Owing to the severity of the winter and early spring, it would not pay to start earlier than we did, and in fact we had a quite low enough temperature as it was on our arrival in our base camp. In a good year we could count on respectable weather only up to June 15. In an early year the weather might break up any time after June 1. So that the problem was really a race against the monsoon.

Our base camp was now established on May 1. We could therefore say that we had our time divided up as follows: We aimed at getting our camp on the Chang La or North Col by May 15, and that would give us fifteen days for certain, twenty-one days with decent luck, and a month if our luck was really good, to work on the mountain itself. We considered this would probably be ample if these dates could be adhered to. I therefore strove by every means in my power to collect a sufficient number of porters to assist our own men. It must be understood though that the Dzakar Chu and neighbouring part of Tibet is very sparsely populated, and not only that, but the ploughing season and spring were approaching and it was absolutely necessary for these people to work on their fields. I had been given a promise of 90 porters to help, but only 45 were forthcoming. After two days' work these 45 said that their provisions were done and they must go for more. Taking the best guarantees we could, we let them go, but they never appeared again, so we had to set to work with our own men to move as much stuff as we possibly could and get the Expedition forward. At the same time we used the agent of the Shekar Dzongpen and our own sardar to scour and scrape the entire Dzakar Chu for porters. In order to get them we had to offer very high wages. These porters came up in batches, sometimes ten, sometimes half a dozen, sometimes five-and-twenty. They worked for short periods and then went away to their ploughing, but under these conditions and with a little arrangement we were able to get our work done.

We established a staging system up the East Rongbuk glacier, making Camps I., II., and III. as shown on the map. Each of these camps was fully rationed and supplied with a cook. This of course was done gradually, everything being pushed up in batches, and here the value of our transport officers and of our Gurkha N.C.O.'s came in. They were given charge of different stages. The Tibetan coolies could be used only for the first two stages; our own porters moved everything from Camp II. to Camp III.; and also great quantities of stores right up from the base camp to Camp III. The approximate heights were: The base camp 16,500 feet; Camp I. 17,800 feet; Camp II. 19,800 feet; Camp III. 21,000 feet. This required the most continuous hard work. I do not think ever before in the history of Himalayan exploration have

men been called on to do harder, or even as hard, work. I think their performance was absolutely without precedent. The track itself was very rough, the elevation was very great, and yet these men put a full month's stores into these camps sufficient to keep 12 Europeans and 50 of themselves. They also carried the great oxygen outfit, tents, and alpine equipment and an immense mass of stuff. Further than that, as soon as these camps were established they moved what was required to form the base at the Chang La, Camp IV., and from there carried loads for the first climbing party to 25,000 feet, and for the second party to 25,500 feet. I may point out that only on one occasion before has a camp been slept in for one night at 23,000 feet. This camp on Chang La was continually occupied by quite large parties, as mountaineering parties go. One man even made four trips to the 25,000 camp, on one occasion carrying as much as 40 lbs.

During the whole of this period the climbing parties themselves were being pushed up to the different camps, the transport officers taking charge of the lines of communication, headed by a party of climbers who were quickly established at Camp III., whence Mr. Mallory and Dr. Somervell prepared the road up to the North Col. Finally, the whole of the climbing party was assembled at Camp III.

While we were at the base camp our Sherpa coolies were visited by some of their relations, men, women, and children, who had come up from the great Sherpa settlements of Sola-Khombu and across the Nghaugha or Khombu La, which is 19,000 feet, and then up to our camp, some of the wives even carrying babies of six months old over this pass, and sleeping out in the open under rocks the whole time.

I am not going to touch on any of the mountaineering, as I am leaving that for Colonel Strutt, Mr. Mallory, and Captain Finch, but I must mention the way the porters took the accident. Two of them lost brothers, and others their special friends, but not a single man has shown any desire not to return; in fact, in Darjeeling on our return every single man volunteered for the next year. One man on the way down pressed me several times to know whether he might go back with a friend and try and retrieve stuff that we had left at the North Col. After the accident the Lama at Rongbuk played up very well. I paid money for services to be said in the monastery for the men who were lost, and he went out of his way to send for the porters and again bless them, which they thought a great deal of.

But Sherpas and high-living Nepalis have this belief: When there is an accident, and a man falls either in the high mountains or from a cliff into the river, it is called "Parmeshwar ko balidhan bhayo," which means "a sacrifice to God," and they believe that if any one visits the same place *on the same date and hour* he will equally fall and be killed.

When the camps were moved down after our last attempt under the direction of Captain Morris, he told me that it was perfectly wonderful

to see the effect of the south wind even in the two days that he was evacuating the camps. Whole hillsides had become rotten, and even the great seracs, which are shown in the pictures so clearly, had begun to tumble down, and the great trough in the glacier which Colonel Strutt will describe, was filled in no time with a rushing stream. As long as the west wind, the great enemy of all climbing at this end of the Himalaya, is blowing, the mountain is generally in a fairly safe and firm condition. Though the west wind is a horrible wind blowing the whole length of the Himalayas and inconceivably cold, still it is dry. The south monsoon winds are warm and wet and destructive.

One thing that was proved is that woollen garments for very great heights are not sufficient in themselves, and that it is necessary to have wind-proof outer clothes. I think it is extremely likely that the break-down of Tejbir, the Gurkha who went so high with Captain Finch and with Captain Geoffrey Bruce, is due to the fact that he had no wind-proof clothing.

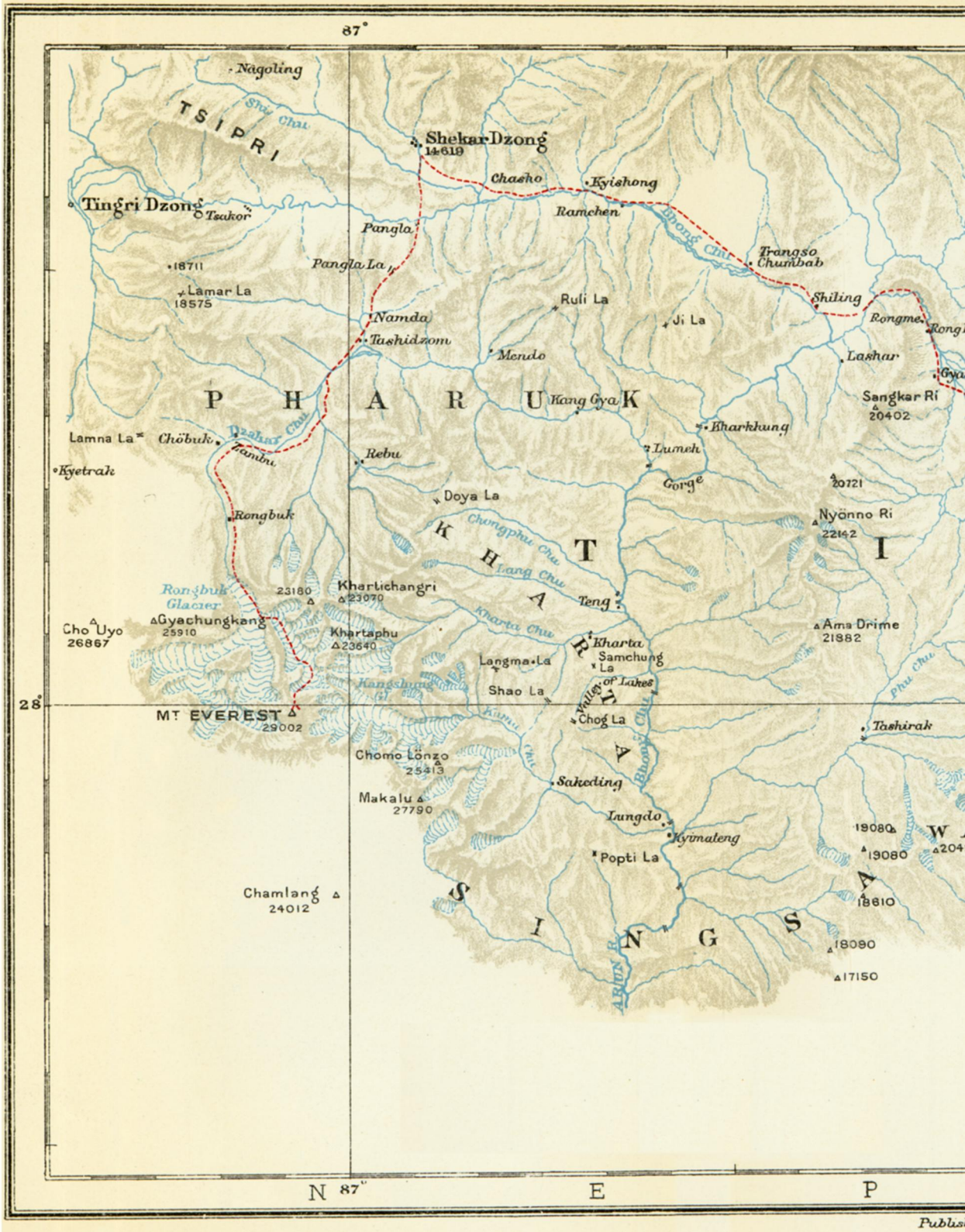
It is not my province to-night to touch either on the mountaineering efforts of the party or on the oxygen apparatus, but I may point out that the experiences of the Expedition must very much modify the scientific outlook on the power of ascending to great altitudes, on acclimatization, and on the manner in which oxygen should be employed.

Although I am not touching on the mountaineering side of the Expedition, I must here tender my thanks and the thanks of us all to my two transport officers, Captain Geoffrey Bruce and Captain Morris, for their hard and unselfish labours, and in one particular especially to Captain Morris, who counteracted the effect of my rather peculiar handwriting, thus making it possible for me to communicate with the President of the Mount Everest Committee. The thanks of all of us are also especially due to Captain Noel, the official photographer, for his unremitting and astonishing enthusiasm; the wonderful success which he has obtained we shall not be able fully to realize until we are able to enjoy his major work, the films.

Finally, before leaving Darjeeling Major Morshead gave me the latest figures of the two magnificent attempts made by the climbing parties on Everest. The first party—Major Norton, Dr. Somervell, and Mr. Mallory—reached a height of 26,985 feet, which is 185 feet higher than our first computation. The climb of Captain Finch and Captain Bruce works out at 27,235 feet. I am sure you will be glad to hear that Major Morshead's numerous frostbites are getting on very well indeed, and that he will not be incapacitated in any way, nor his profession in life interfered with.

I will bring my part of the account of this expedition to an end with a little story. On our way back to India we were met by a Babu in a good position. He said: "Sir, I hear you have climbed the Himal by means of thread—no doubt the thread of life."


The Route of the
MOUNT EVEREST EXPEDITION 1922
CHUMBI TO MT EVEREST
from the Maps of the 1921 Expedition.
Scale 1/750,000 or 1 Inch = 11·84 Stat. Miles.
10 0 10 20
Route of the Expedition
Pass
Heights in feet.
87°
88°
89°
28°
Nagoling
TSIPRI
Shekar Dzong
14619
Chasho
Kyishong
Tingri Dzong
Tsakor
Ramchen
Nyope
Chiundu
Pangla
Pangla La
Trangso Chumbab
18711
Lamar La
18575
Namda
Tashidzom
Ruli La
Ji La
Shiling
Rongme
Rong Kong
Mendo
Lashar
Gyangkar Nangpa
Tsomotretung
P H A R U K
Kang Gya
Sangkar Ri
20402
Tinki La
16926
Tinki Dzong
13800
Chushar
Lamna La
Chöbuk
Kyetrak
Rebu
Kharkhung
Lumeh
Gorge
Lingga
Kampa Dzong
15200
Tuling La
Doya La
20721
Yaru Chu
Tatsang
Dug La
Rongbuk
Nyönno Ri
22142
Kheru
Bam Tso
K H A T T I B E T
Rongbuk Glacier
23180
Khartichangri
23070
Teng
Serpo La
Cho Uyo
26867
Gyachungkang
25910
Khartaphu
23640
Kharta
Samchung La
Ama Drime
21882
Chumiumo
22430
Dongkar La
Langma La
Shao La
Kangshung
Langphu
21506
Chorten Nima La
21240
MT EVEREST
29002
Chog La
Tashirak
Tuna
Chomo Lonzo
25413
22700
Pawhunri
23180
Chabuk La
Sakeding
Makalu
27790
Thango
Lungdo
Kyimateng
24400
Tang La
15200
Chomolhari
23930
19080
W A L U N G
Popti La
20450
S I K K I M
Chamlang
24012
18610
21030
Phari Dzong
S I N G S A
18090
20200
Kangchenjunga
28150
17150
Arun R.
Tista R.
Chumbi Valley
18500
18730
Galingka
Chumbi
N E P A L


87°
Nagoling
TSIPRI
Shar Chu
Shekar Dzong
14619
Chasho
Kyishong
Ramchen
Tingri Dzong
Tsakor
Pangla
Pangla La
18711
Lamar La
18575
Ibong Chu
Trangso
Chumbab
Shiling
Ruli La
Ji La
Namda
Tashidzom
Mendo
Rongme
Lashar
PHARU
Kang Gya K
Sangkar Ri
20402
Lamna La
Chöbuk
Dzakar Chu
Tambu
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Bharkhung
Lumeh
Gorge
20721
Doya La
Rongbuk
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22142
Chongphu Chu
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I
Rongbuk Glacier
23180
Khartichangri
23070
Tang Chu
Teng
Cho Uyo
26867
Gyachungkang
25910
Khartaphu
23640
Khartsa Chu
Kharta
Ama Drime
21882
Samchung La
Langma La
Valley of Lakes
Phu Chu
Kangshung
Shao La
RUTA
MT EVEREST
29002
Chog La
Tashirak
Kama Chu
Chomo Lonzo
25413
Bhong Chu
Saketing
Makalu
27790
Lungdo
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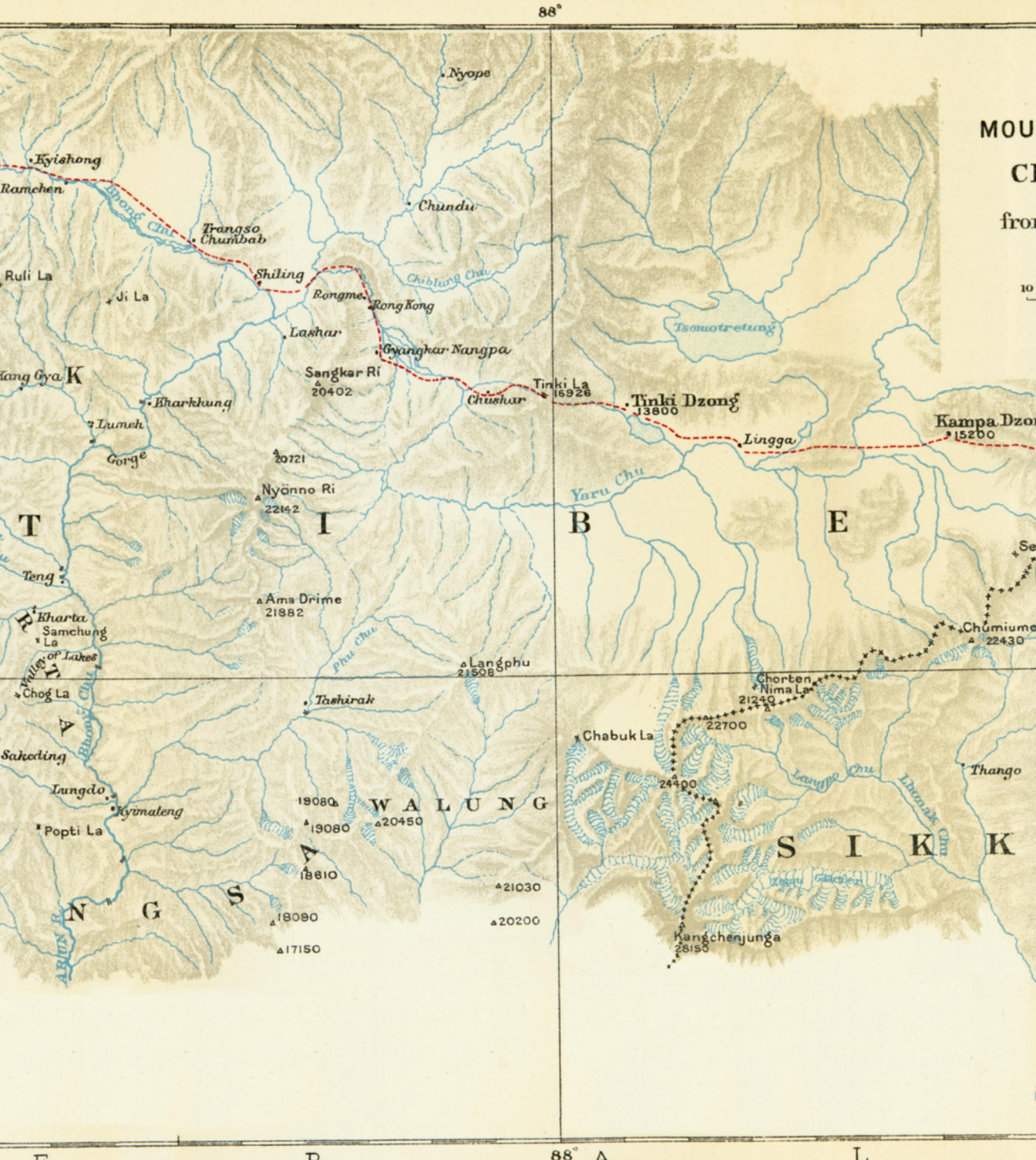

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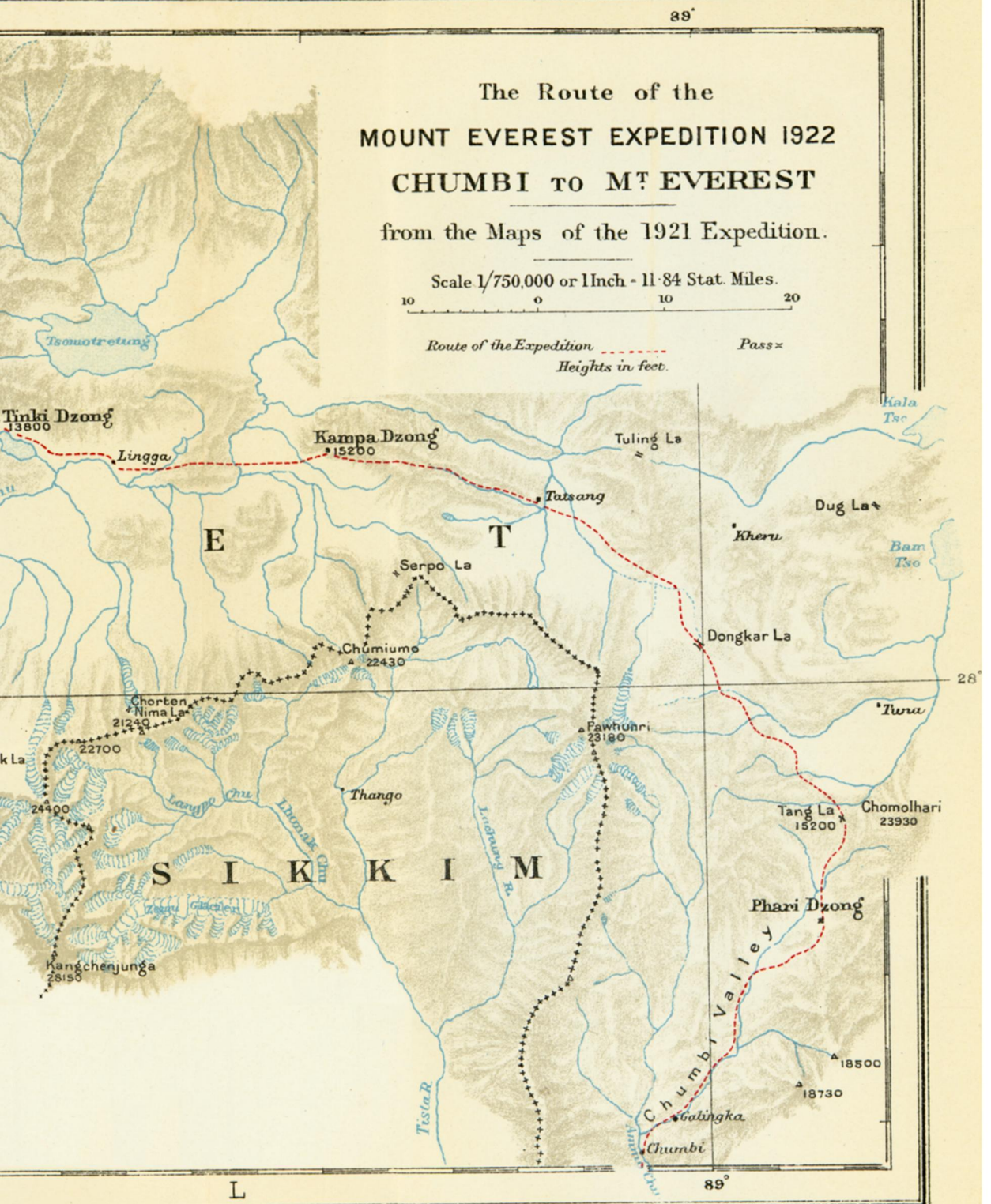

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MT EVEREST EXPEDITION, 1922.

THE EAST RONGBUK GLACIER

Lieut.-Colonel E. L. Strutt, D.S.O., Second in Command of the Expedition

ON May 2 with Norton, Finch, two Gurkhas and one coolie I started, under General Bruce's instructions, to find a site for No. I. Camp. We took to the rocky terraces high above the right bank of the Rongbuk glacier, which really constitute the lateral moraine of that glacier. Going very slowly but steadily over a quite good surface, we eventually reached the corner above the large opening where the east branch meets or did meet, the main Rongbuk glacier. Here the conditions changed and we descended towards the snout of the tributary glacier over abominably loose and slippery moraine. At a spot some 300 yards distant from the snout of the East Rongbuk we chose a site for the first camp. The place was sheltered, and it may here be remarked that this camp proved satisfactory and was perhaps the warmest spot that I struck in Tibet. The height is about 18,000 feet, and it is an easy three hours up, or one and a half hours down, from the Base Camp.

On the way back we took to the trough between the glacier and the moraine, which the coolies who were following us up with Morris appeared to have instinctively preferred. The terrace route was however the best, as was proved later when repeated bursts of a glacier lake occurred and flooded the trough. Morris at once set to work to build sangars in the camp. We returned to the base at 16.20, having proved to our complete satisfaction, on the ice and snow in the trough, the vile quality of the Swiss Oberland axes that Finch and I were supplied with. The day was fine, as was the following one, but heavy snow fell all day on May 4 in the Base Camp.

May 5.—The day broke brilliantly and the snow soon evaporated, the ground remaining dry and quite unaffected. Bruce had arranged that I should start on the first reconnaissance this day. I was given *carte blanche* as to my party. I chose Longstaff, Morshead, and Norton. They proved an ideal party, full of energy and experience and not too young. Morshead and Norton are blessed with the sweetest tempers and dispositions, while Longstaff and I, who are gifted with just the reverse, were able, on the strength of a friendship of many years' standing, to curse each other freely and without malice. We left the base at 09.45 with sixteen coolies. All were heavily laden, that is to say, the coolies were carrying about 60 lbs. and I about 20 lbs. The day remained fine and warm and the walk up to No. I. Camp *viâ* the trough was quite hot. We got into camp at 12.45 and found it already comfortably installed, thanks to Morris's and Geoffrey Bruce's exertions of the previous day. Norton and Morshead, who generally enjoyed the privilege of a little extra work, set out to explore the

further route up the East Rongbuk. A good night was spent, all four sleeping in a sangar with a canvas top over it.

May 6.—We left at 07.30 in fine weather and at once took to the left lateral moraine of the glacier. Subsequent experience in the descent caused us to modify this route and to choose the western medial moraine, over which an admirable path was soon automatically constructed by the passage of many heavily laden coolies. The going was atrocious and very slow, and no one, not even Morshead, appeared anxious to lead, at any rate I usually found myself *en tête*. At 11.50, in somewhat weary condition, we found ourselves on the bank of the large lateral glacier flowing from the west into the East Rongbuk, which glacier descends steeply from the peaks constituting the northerly spurs of the north peak of Everest. This glacier, consisting of hard slippery ice, had to be crossed, but I suspected the presence of a cliff near its point of junction, *i.e.* approximately point 19,360 feet of Major Wheeler's admirable map. Accordingly, I altered the course of the somewhat jaded party from due south to south-west, and halting them on the moraine proceeded to cross the tributary glacier, steering for point 20,590 well above us. There were ice cliffs in many directions, but I was nevertheless able to cross the glacier without difficulty and to return to the party. As it was late, we camped where I had left them. As it was obvious that this camp was unsuitable, Morshead and Norton returned later in the evening to the East Rongbuk glacier, and taking with some difficulty to the medial moraine, found a more or less sheltered moraine slope between the ice of the two glaciers, which entailed no subsequent ascent or descent *en route*. The weather was bleak and cold and snow fell in the night.

May 7.—We struck camp and got away at 07.30, descending to the East Rongbuk. In half an hour we reached the site for No. II. Camp, and dumped the heavy loads. It was a strange spot, point 19,360, with a high moraine opposite (east), and enormous ice cliffs with a frozen lake at their base to the north. Leaving Longstaff and all the coolies, except one, there to pitch the camp, Morshead, Norton, and I, with Namgya my own particular Bhotia, proceeded up the left lateral moraine of the East Rongbuk. After an hour's bad going over the stones we came to the spot where the next very large glacier descending from the south-west cuts across our route. To our right were high rotten schist-like cliffs, and to our left enormously high séracs or rather, perhaps, ice pyramids. Some of these pyramids must be from 150 to 300 feet high, growing in places out of moraine channels, in others out of the parent ice. It was obvious that we must take to the East Rongbuk ice at once. Building a cairn at the spot where we must leave the stones, we turned sharply east and forced a passage through the séracs. It appeared to be difficult but was really not so, at any rate to any one with much ice experience. In half an hour or so we emerged on smooth ice near the centre of the glacier; we now turned south-east and bore up the glacier, the point of

direction being approximately 22,340 some miles away and east of the great gap subsequently christened Rapiu La, on account of its genial climate. Soon, to our disgust, we came to an enormous trough or trench, shown on Wheeler's map, which seams the whole glacier from south to north, starting from near point 20,100 and continuing, for all I know, right down to the snout of the East Rongbuk. This trench is about 300 to 400 yards wide and some 100 feet deep; it is paved in many places with gravel-like moraine.

Some one thought that we should do better nearer the north peak, so avoiding the trench we bore to the south, steering for point 22,090 feet high above us. The heat was great, and we experienced our first real symptoms of mountain lassitude. It was here that, for the first and last time, I appeared to suffer less than my younger companions. We came to the névé slopes below 22,090, somewhere near 20,100, and commenced skirting towards the corner on our right front (south), round which we knew that Everest would become visible. The slopes were steep and slippery, step-cutting becoming occasionally necessary; we were always being driven too high, and about 13.00 hours the inevitable occurred: a great range of ice cliffs, 300 to 500 feet high, cut off all further progress. We turned sharp down to the left (east), and endeavoured to regain the glacier. The trench was by now left far behind us and to the north. The going was very bad, and although the route between the glacier and the north peak slopes was possible, it was very long and far too fatiguing for the laden coolies who must use it. We were all agreed that we must return to No. II. Camp, and on the following day cross the great trench and mount by the glacier throughout. We accordingly turned about and proceeded home. Morshead lagged behind, and I was hoping that it was fatigue overcoming him; however, he rejoined us near the séracs and informed us that he had been looking at the trench, had found a feasible spot, and had actually descended and crossed it. This was a fine performance, as well as a great relief, as I had been fearing prolonged step-cutting. It should be remembered that our whole object was to find an easy route where laden coolies could proceed without the assistance of the European climbers.

We returned to camp about 18.30. Longstaff, who had not accompanied us on account of what he described as old age, was ill with a sharp attack of what appeared to be influenza and which he had experienced before on his many Himalayan expeditions. We were all rather alarmed at his condition. My companions, including the invaluable Namgya, appeared to be very fit again, and Morshead, whose appetite, like his walking powers, is unsurpassable, consumed fourteen bowls of Hoosh. Two were sufficient for Norton and one for myself.

May 8.—We left camp at 07.55, with eight coolies carrying three tents and some food. Longstaff was no better and had to remain in bed. We took the same route as the day before and crossed the trench at the spot

discovered by Morshead; a large cairn consisting of rocks from the bottom of the trench was erected, and a Gurkha signalling flag was fixed in a sérac to mark the exit on the further side. We now struck the first snow at a height of about 20,000 feet; it was thin and the ice terribly hard and slippery underneath. As we approached the corner previously referred to, the wind rose and the cold became great; both these, however, diminished as we rounded the corner, and Everest suddenly burst on us in all his majesty at a distance of only about 2 miles.

The glacier began to become crevassed, and we roped ourselves and the coolies in three parties; at 12.27 we reached the spot selected by Longstaff months before as suitable for the advanced camp. It is a dreary strip of moraine between the glacier and the cliffs of the north peak. The scenery can be described as the very soul of utter desolation. To the south towers Everest, or rather the eastern half of the north face. This small portion is alone double or treble in size of any mountain that I have seen in Europe: the shoulder, point 27,390, is the highest point visible and appears overwhelmingly remote, although not 2 miles distant. To the west are the glittering ice slopes of the Chang La (North Col), and to the immediate north the steep broken rocks of Changtse's eastern arête. Down the glacier to the north are the inexpressibly dreary and hideous slopes of Kartaphu and his lower satellites. This spot (No. III. Camp, about 21,000 feet) is supposed to be sheltered from the west wind and is sufficiently protected against stone fall from Changtse. I should again like to pay a humble tribute to Wheeler's map and Longstaff's topographical instinct. We dumped our stores and rested for an hour or more in the only warm sunshine I ever experienced in No. III. At 13.45 we again tied up and, with the coolies unladen and going at express speed, attained No. II. Camp in about two hours. Longstaff's condition was still rather alarming, but he was very cheerful.

May 9.—Longstaff and three coolies left early, so as to be able to go slowly, *en route* for No. I. We others followed at 08.30. Keeping on the medial moraine and constructing many cairns, we reached No. I. Camp, a scene of great activity, in about three hours. Here we left Longstaff in good hands, and reached the base camp about 14.30. The reconnaissance had been a success, and we experienced the finest weather of the whole trip.

May 10.—Longstaff was carried down in the morning, and Mallory left for No. III. Camp with Somervell and forty of other ranks. Three bitterly cold days followed, but on May 14 Norton, Morshead, and myself, together with seven coolies, again set out for No. III., reaching No. II. in some seven hours' very easy going. The tracks had improved beyond all knowledge, thanks to the endless stream of traffic, and Morshead led most of the way at his usual terrible speed; the weather was fine. On the following day, May 15, with thirty-six coolies we set out for No. III. The men went admirably, but much of the snow on the glacier had

evaporated, and the ice was exceedingly slippery. Crampons were accordingly tried by some of the men—the only use that I saw made of these encumbrances. I may be prejudiced, but crampons appear to be effective only on level ice where slips are of no importance. We reached camp about midday, and found Mallory and Somervell just returned from the North Col, where they had been fixing ropes for the use of the coolies over the steeper parts.

May 16 was a very cold day, and we remained shivering in camp, every now and then assailed by furious blasts of down-draught from the westerly gale raging above.

May 17.—Morshead, Norton, Somervell, Mallory and I, with ten coolies, set out for the North Col, leaving at 09.15. We were roped in three parties, and followed in the steps cut by Mallory two days previously. Many of these, especially in the neighbourhood of the bergschrund, the scene of the tragedy of June 7, had to be remade. My companions, Europeans as well as natives, appeared to make light of the toil, but my wind grew steadily worse. I was soon obliged to give up the lead of my own particular party, and to tie myself on in rear. As there was no improvement I eventually untied myself altogether. Freed from the weight of the rope between myself and the next man—possibly half a pound—I was able to keep up with some comfort; at any rate, we reached the summit of the pass at 13.45. The heavily laden coolies—some were carrying about 60 lbs.—appeared in no way distressed; neither did I —when sitting down! The eastern slopes of the Chang La are steep in places. [It is always difficult to make comparisons, but for the benefit of mountaineers, I should compare it to the northern face of the Col Tournanche between the Matterhorn and Dent d'Hérens.] Owing to driving mists there was no distant view to the west, but the crossing of the col from east to west, or better in the reverse direction, appears to me perfectly feasible. Great care in selecting a route would, of course, be necessary, and the chronic gale from the west would be a terrible obstacle. Our route is the proper one to the summit of Everest. The Changtse rises grandly to the north, obviously a prolonged piece of step-cutting along a most exposed and precipitous ice ridge. Leaving several tents and our loads, we started down at 14.20. Although unable to lead, I found that I could still come down as last man, Mallory and I taking a party of six coolies down. With a little encouragement from above they showed great skill and care.

We were back at No. III. by 16.00. It was by now quite certain that the first attempt on the summit of Everest should be made by Somervell, Mallory, Norton, and Morshead. I was going infinitely worse than any of these; the first expedition, on account of there only being two Meade tents available for the 25,000 feet camp, should consist of not more than four Europeans. I had to choose between Morshead and myself, and I naturally chose the former.

I should, before completing this part of the lecture, like to make a few remarks on the first attempt on the summit. Before and while this attempt was being made there were in No. III. Camp beside myself, Finch, Geoffrey Bruce, and Wakefield; while Morris and Noel arrived on May 21. So bad was the weather on May 21 that I was anxious about the safety of the high altitude party. During the morning and early afternoon, Finch, Bruce, and a party of coolies stood by to start as soon as the conditions became at all possible. Over a foot of snow fell during the day in No. III. Camp, and the weather was bitter in the extreme. In the event of Finch being able to start with a relief party, I gave him written instructions not to proceed beyond the 25,000 feet camp in the existing conditions. Fortunately it cleared a little towards evening, and the party were observed descending to the Chang La camp.

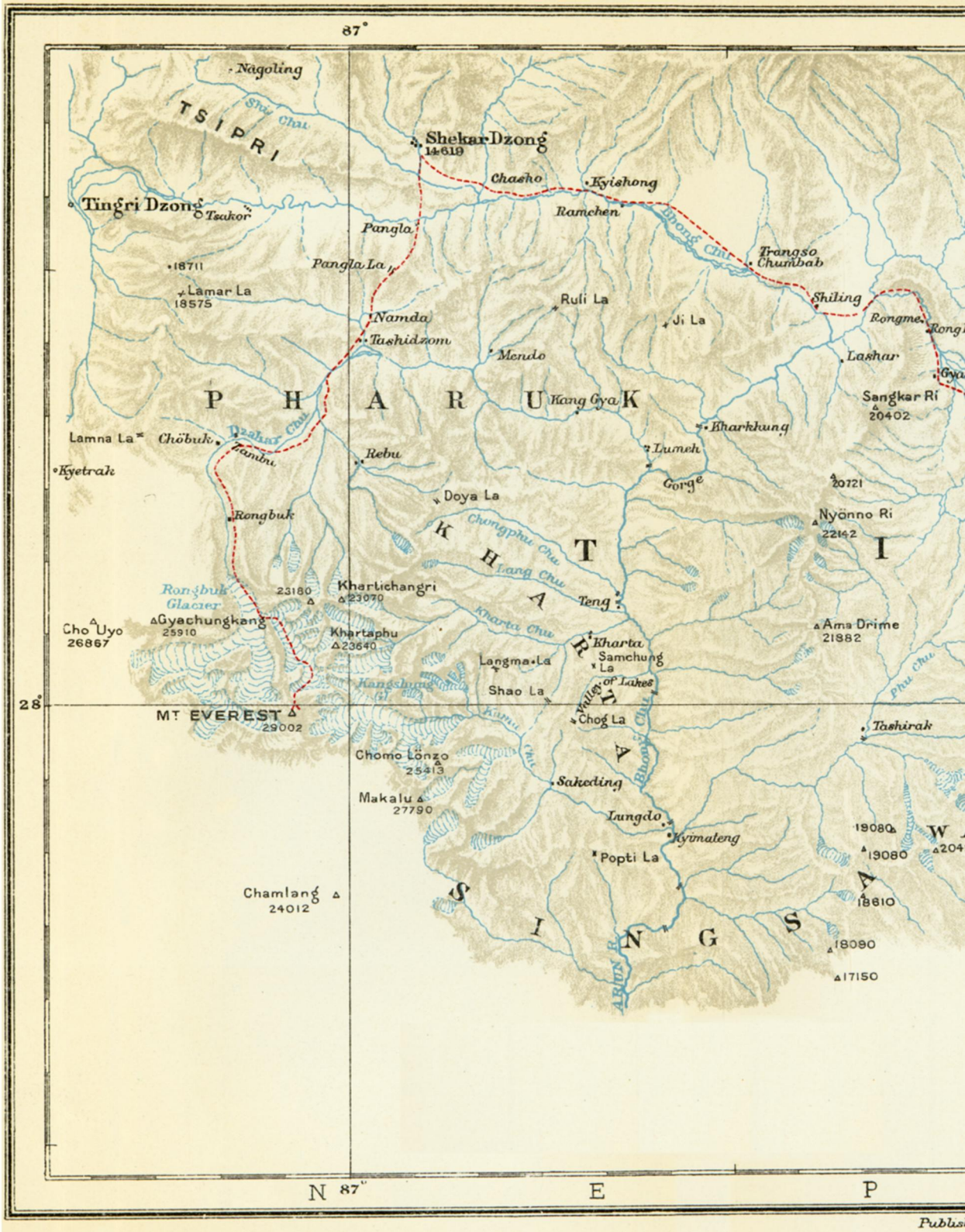
On the early morning of May 22, the temperature being then -9° Fahr., Finch and Bruce, using oxygen, with a party of coolies, started for the col, Wakefield being added to the party in case medical assistance was required. These met the high climbing party returning, and Wakefield accompanied them to No. III.

It may be asked why the attempt was made on May 21 without Captain Finch and without oxygen. My reply to this question is as follows: Finch had been ill at the Base Camp, and had not been able to put the oxygen apparatus into working order. He alone of all the members of the Expedition was conversant with its complicated inner economy. The coolies had been working like slaves getting up the absolute necessities, such as food and tents; it had consequently been impossible to bring up the oxygen cylinders, and, moreover, as I have stated, Finch had been too ill to test them. The weather was too uncertain to wait, and the monsoon might break at any moment. It seemed to me then, as it does now, that it was better to try and fail than never to have tried at all.

THE FIRST HIGH CLIMB

George Leigh Mallory

WHEN first the prospect of going to Mount Everest opened for me I used to visualize the expedition in my thoughts as a series of tremendous panting efforts up the final slopes. Later it became a symbol of adventure; I imagined, not so much doing anything of my own will, but rather being led by stupendous circumstances into strange and wonderful situations. Now it has become a problem; with no less interest, and even excitement, the Expedition brings to my mind's eye a view of the long mountain slopes set at intervals with groups of little tents, with loads of stores and sleeping-sacks, and with men. My object at present is to state this problem—partly because without it the story of our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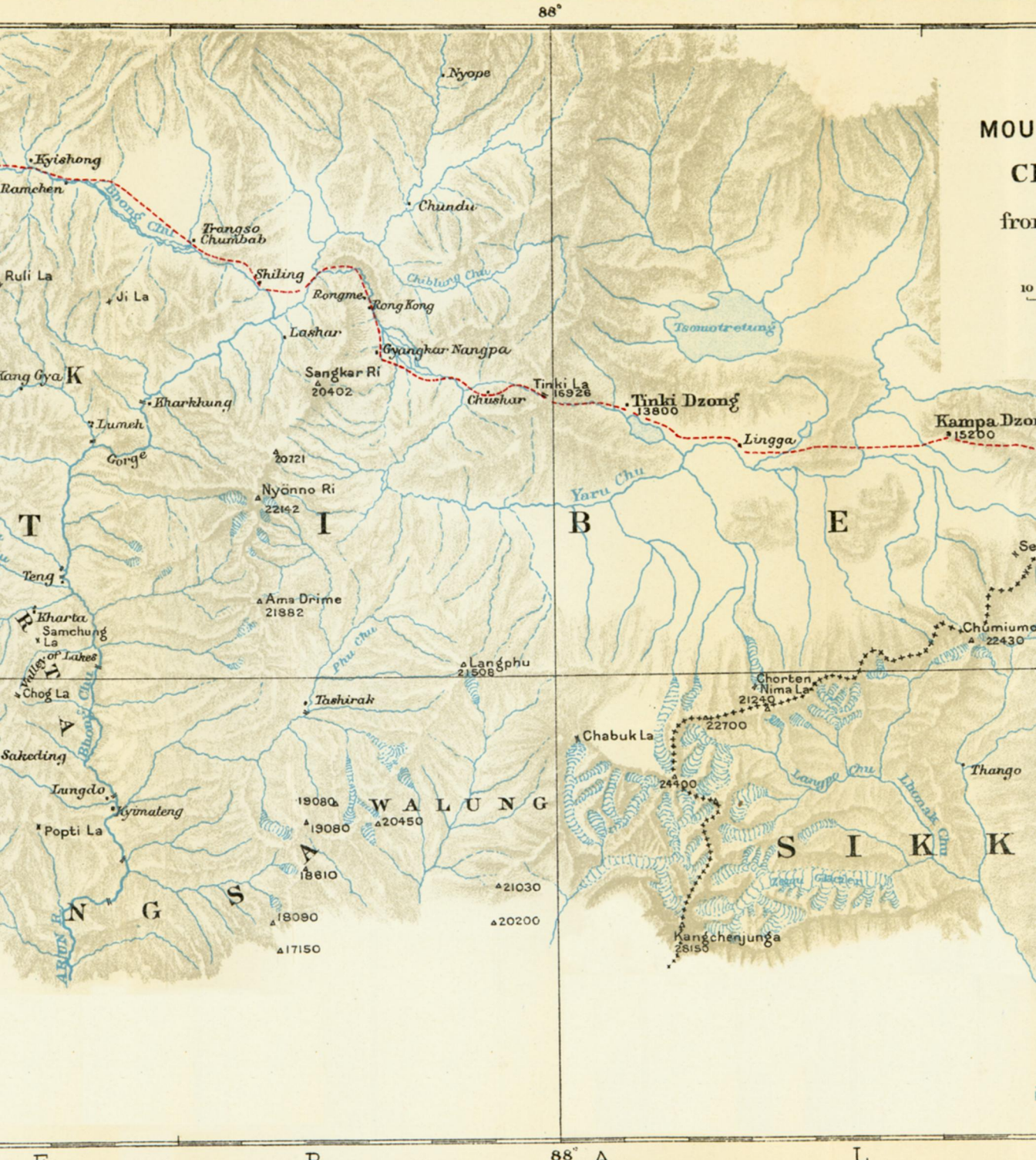

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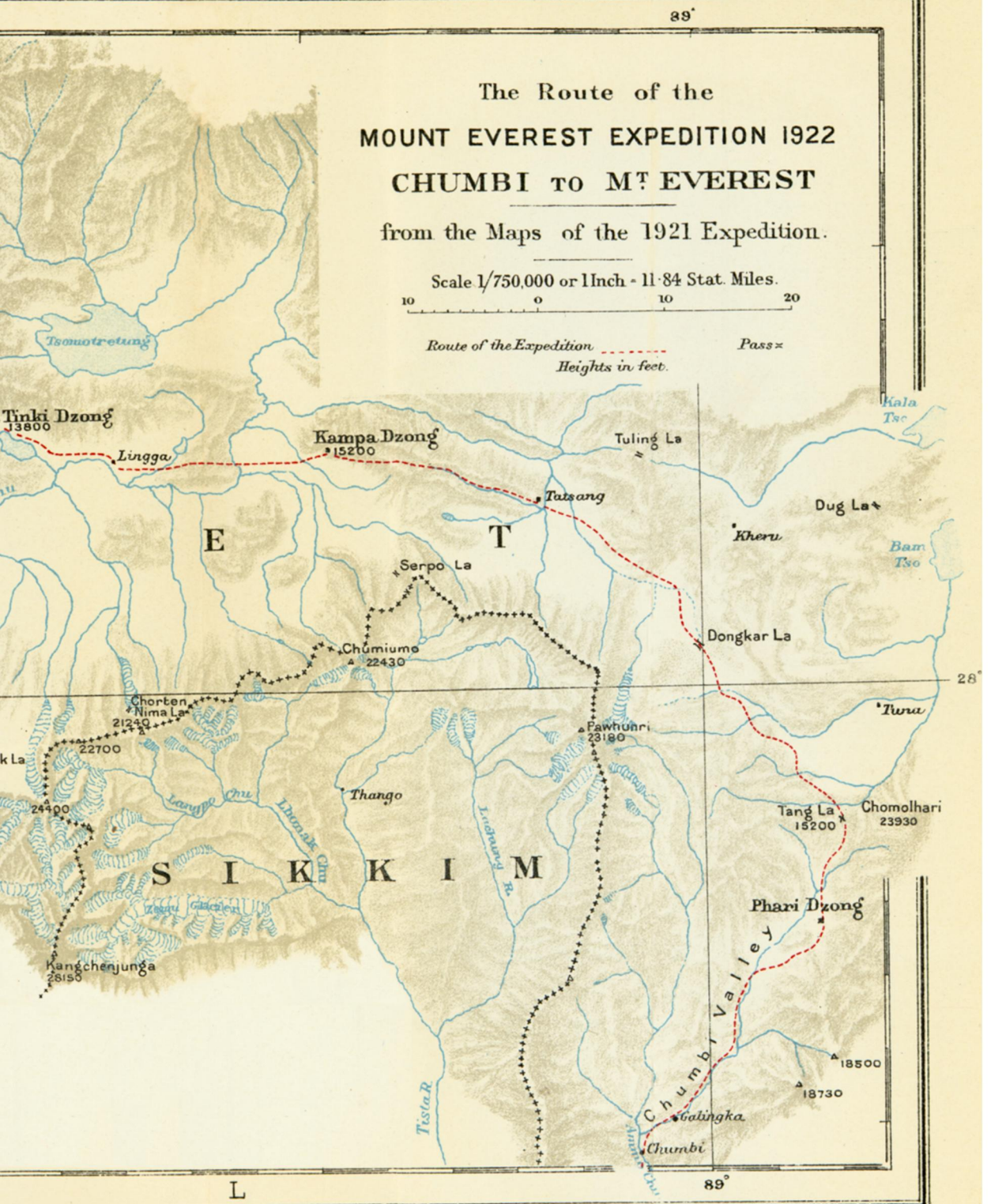

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MT EVEREST EXPEDITION, 1922.

THE SECOND HIGH CLIMB

Captain George I. Finch

THE climbing of Mount Everest is a tremendous proposition. With a clear realization of this, I joined the expedition, ready to do my share in the conquest of the mountain by every means at our disposal. Optimism may be the attribute of fools; but they say that experience teaches even such, and my experience of Alpine climbing had already taught me that no stiff mountaineering problem can be tackled with much hope of success unless one believes wholeheartedly in the possibility of achievement. I think it was Sir Francis Younghusband who, somewhere or other, referred to the necessity of possessing the faith that removes mountains, and a purpose unhoneycombed with half-heartedness. With such an example in our minds throughout that long and, at times, rather trying journey across Tibet, where it was, perhaps, hard to keep one's optimism always unsullied, it was not impossible for one to cling to the watchword "Everest is climbable, and we shall climb it." Confidence alone were of little avail; but allied with enthusiasm and respect for the work in hand it engenders that concentration of mind and energy which acts like a searchlight upon the problem, and seeks solutions for the complicated questions of equipment, tactics, and so forth, involved.

A little over a year ago I had considered, somewhat carelessly and superficially I fear, the advantages of using oxygen as an aid to climbing Mount Everest, and had dismissed the idea on the grounds that the weight of any useful supply would be prohibitive. Prof. Dreyer, however, the Professor of Pathology in the University of Oxford, held the strong opinion that Mount Everest would never be climbed without oxygen, and that an ample supply could be provided in a sufficiently portable form to enable the summit to be reached. The question was examined by the Mount Everest Committee with an open mind, with the result that his opinion was endorsed, and it was decided to include oxygen in the equipment of the expedition. The oxygen equipment, consisting of very light steel cylinders for storing the oxygen and an ingenious apparatus for distributing it to the climber, was evolved by Major Stewart and Mr. Eager of the Air Ministry, and Mr. Unna, in close co-operation with Mr. Davis and Mr. Rosling of the firm of Siebe Gorman & Co. It was somewhat complicated, but frequent oxygen drill parades were taken very seriously by all members of the party.

There are those who do not believe in oxygen. Perhaps it is because simple obvious facts render them uneasy in their unbelief, that they rush into print with a wholesale condemnation on the grounds that its use in high mountaineering is what they rather loosely term "artificial," and therefore unsporting. Now, few of us, I think, who stop to ponder for a brief second, will deny that our very existence in this enlightened

twentieth century with all its amenities of modern civilization is, in the same slipshod sense of the word, "artificial." Most of us have learnt to respect progress and to appreciate the meaning and advantages of adaptability. For instance, it is a fairly firmly established fact that warmth is necessary to life. The mountaineer, acting on this knowledge, conserves as far as possible his animal heat by wearing specially warm clothing. No one demurs; it is the common-sense thing to do. He pours his hot tea from a thermos bottle—and never blushes! Nonchalantly, without fear of adverse criticism, he doctors up his inside with special heat- and energy-giving foods and stimulants! From the sun's ultra-violet rays and the wind's bitter cold, he boldly dares to protect his eyes with Crookes' anti-glare glasses; further, he wears boots that to the average layman look ridiculous! The use of caffeine to supply just a little more buck to an almost worn-out human frame is not cavilled at despite its being a synthetic drug the manufacture of which involves the employment of complicated plant and methods. If science could prepare oxygen in tabloid form or supply it to us in thermos flasks that we might imbibe it like our hot tea, the stigma of "artificiality" would, perhaps, be effectually removed. But when it has to be carried in special containers, its whole essence is held to be altered, and by using it the mountaineer is taking a sneaking, unfair advantage of the mountain! In answer to this grave charge, I would remind the accuser that, by the inhalation of a little life-giving gas, the climber does not smooth away the rough rocks of the mountain or still the storm; nor is he an Aladdin who, by a rub on a magic ring, is wafted by invisible agents to his goal. Oxygen renders available more of his store of energy and so hastens his steps, but it does not, alas! fit the wings of Mercury on his feet. The logic of the anti-oxygenist is surely faulty.

I have seen the opinion expressed—presumably by way of supporting the idea of attempting to climb Mount Everest inadequately equipped, *i.e.* without oxygen—that it is just as important to ascertain how far a man can climb without oxygen as to reach the top by what are called "illegitimate" means. It may be important, but it was not the object which the expedition had to attain.

General Bruce had brought us safely, both mentally and physically, through Tibet to the Base Camp. Put baldly thus, it may sound a small accomplishment; actually, the task was one demanding the highest qualities of generalship and powers of organization. When we left him at the Base, his great fund of energy and cheerful good wishes for success continued to encourage us.

On May 20 Geoffrey Bruce and I arrived at Camp III. We were accompanied by Tejbir, one of the four Gurkha non-commissioned officers on the expedition and as fine a type of Gurkha humanity as one could wish to see. The cylinders containing our oxygen were found to be in good condition; but the apparatus—through no fault of the

makers, who had, indeed, done their work admirably—leaked very badly, and to get them into satisfactory working order, four days of hard toil with soldering iron, hacksaw, pliers, and all the other paraphernalia of a fitter's shop were necessary. Our workshop was in the open. The temperature played up and down round about 0° F., but inclined more to the negative side of that irrational scale. Even handling bits of metal in the bitter cold, often with bare hands on account of the delicate nature of some of the repairs, did not prevent Geoffrey Bruce from helping me with that energy, great will, and good nature that he showed so abundantly throughout the whole of our climb together. The masks from which the oxygen was to be breathed proved useless, but by tackling the problem with a little thought and much cheerfulness a satisfactory substitute was eventually evolved. Preparatory to embarking on the climb itself, we went for several trial walks—one over to the Rapiu La, a pass 21,000 feet high, at the foot of the north-east ridge of Everest, from which we hoped to obtain views of the country to the south. But only part of the north-east ridge showed hazily through drifting mists. Towards the north and looking down the East Rongbuk glacier, views were clearer, though partially obscured by rolling banks of cloud. Colonel Strutt and Dr. Wakefield, unoxygenated, accompanied us on this little expedition, and oxygen at once proved its value, so easily did Bruce and I outpace them. On our return to Camp III., the delicate white mists floating in the sky above the North Col seemed to beckon to us to climb these snowy slopes and see what lay hid in the back of beyond. So two mornings later we started off for the North Col on another trial trip. In the afternoon we returned to Camp III. There had been a considerable amount of step-cutting, for fresh snow had fallen, compelling us to deviate from the usual route; but even so oxygen had made a brief Alpine ascent of what is otherwise a strenuous day's work. We took 3 hours up and 50 minutes down, with 36 photographs taken *en route*.

On May 24, Captain Noel, Tejbir, Geoffrey Bruce, and I, all using oxygen, went up to the North Col (23,000 feet). Bent on a determined attack, we camped there for the night. Morning broke fine and clear though somewhat windy, and at 8 o'clock we sent off up the long snow slopes leading towards the north-east shoulder of Mount Everest, twelve porters carrying oxygen cylinders, provisions for one day, and camping gear. An hour and a half later, Bruce, Tejbir, and I followed, and, in spite of the fact that each bore a load of over 30 lbs., which was much more than the average weight carried by the porters, we overtook them at a height of about 24,500 feet. They greeted our arrival with their usual cheery, broad grins. But no longer did they regard oxygen as a foolish man's whim; one and all appreciated the advantages of what they naïvely chose to call "English air." Leaving them to follow, we went on, hoping to pitch our camp somewhere above 26,000 feet. But shortly after 1 o'clock the wind freshened up rather offensively, and it began to

snow. Our altitude was 25,500 feet, some 500 feet below where we had hoped to camp, but we looked round immediately for a suitable camping site, as the porters had to return to the North Col that day, and persistence in proceeding further would have run them unjustifiably into danger. This I would under no circumstances do, for I felt responsible for these cheerful, smiling, willing men who looked up to their leader and placed in him the complete trust of little children. As it was, the margin of safety secured by pitching camp where we did instead of at a higher elevation was none too wide; for before the last porter had departed downwards the weather had become very threatening. A cheerful spot in which to find space to pitch a tent it was not; but though I climbed a couple of hundred feet or so further up the ridge, nothing more suitable was to be found. Remembering that a wind is felt more severely on the windward side of a ridge than on the crest, a possible position to the west of the ridge was negatived in favour of one on the very backbone. The leeside was bare of any possible camping-place within reasonable distance. Our porters arrived at 2 p.m., and at once all began to level off the little platform where the tent was soon pitched, on the very edge of the tremendous precipices falling away to the East Rongbuk and Main Rongbuk glaciers, over 4000 feet below. Within twenty minutes the porters were scurrying back down the broken rocky ridge towards the snow slopes leading to the North Col, singing as they went snatches of their native hillside ditties. What splendid men! Having seen the last man safely off, I looked to the security of the guy-ropes holding down the tent, and then joined Bruce and Tejbir inside. It was snowing hard. Tiny, minute spicules driven by the wind penetrated everywhere. It was bitterly cold, so we crawled into our sleeping-bags, and, gathering round us all available clothing, huddled up together as snugly as was possible. With the help of solidified spirit we melted snow and cooked a warm meal, which imparted some small measure of comfort to our chilled bodies. A really hot drink was not procurable, for the simple reason that at such an altitude water boils at so low a temperature that one can immerse the hand in it without fear of being scalded. Over a *post prandium* cigarette, Bruce and I discussed our prospects of success. Knowing that no man can put forward his best effort unless his confidence is an established fact, the trend of my contribution to the conversation was chiefly, "Of course, we shall get to the top." After sunset the storm rose to a gale, a term I use deliberately. Terrific gusts tore at our tent with such ferocity that the ground sheet with its human burden was frequently lifted up off the ground. On these occasions our combined efforts were needed to keep the tent down and prevent its being blown away. Although we had blocked up the few very small openings in the tent to the best of our powers, long before midnight we were all thickly covered in a fine frozen spindrift that somehow or other was blown in upon us, insinuating its way into sleeping-bags and clothing, there to cause acute discomfort. Sleep

Phot. by Capt. J. B. Noel

1. LOOKING UP THE EAST RONGBUK GLACIER FROM ABOVE CAMP II

Phot. by T. H. Somervell

2. MALLORY AND NORTON APPROACHING THEIR HIGHEST POINT (26,985 FEET)

Phot. by T. H. Somervell

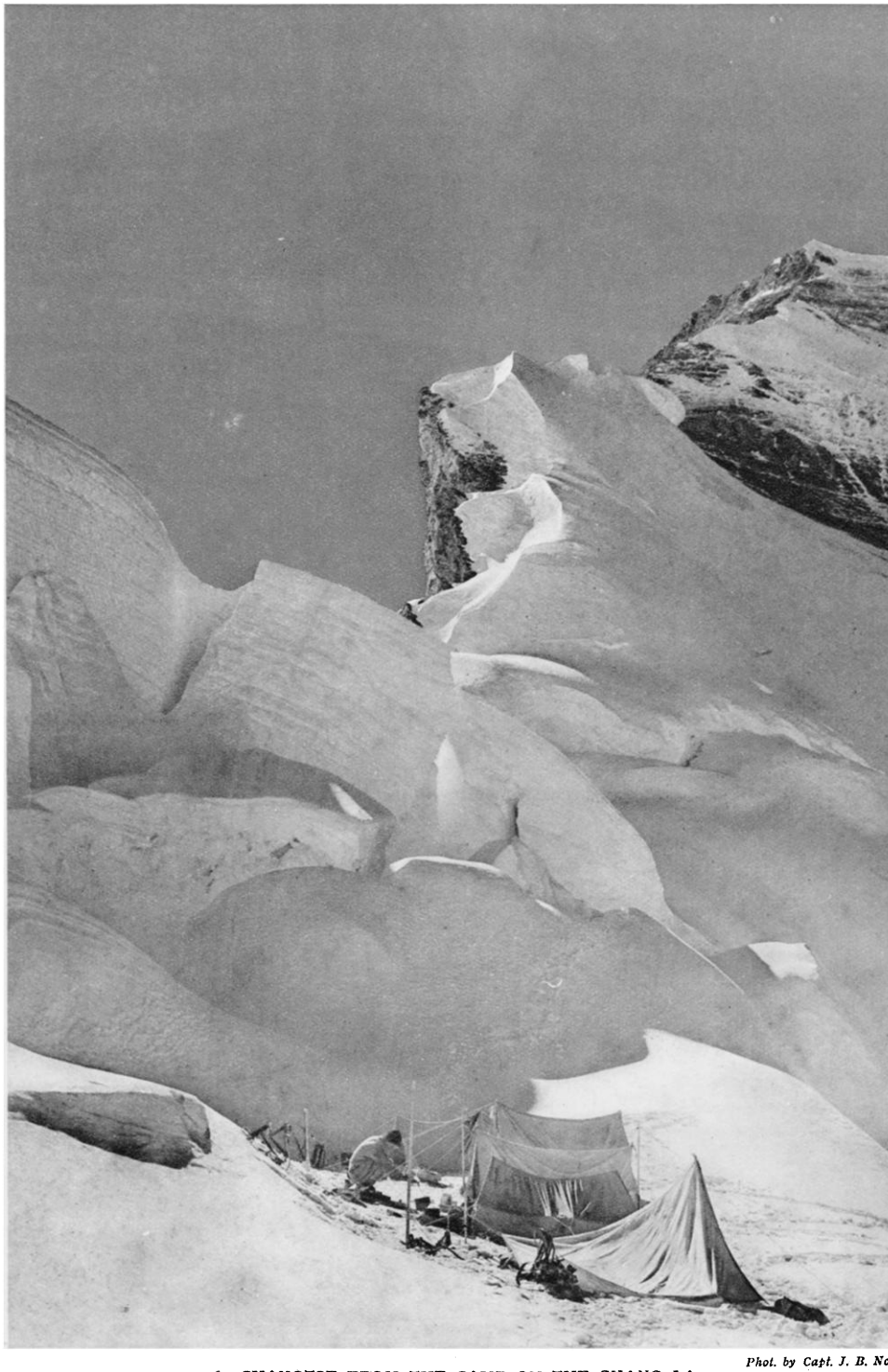
3. THE WAY TO THE SUMMIT FROM THE HIGHEST POINT OF THE FIRST CLIMB

Phot. by Capt. G. I. Finch

4. A FROST-BITTEN CLIMBER HELPED DOWN THROUGH THE SERACS TO CAMP II

Phot. by Capt. G. I. Finch

5. THE OXYGEN PARTY AT THE CHANG LA CAMP



Phot. by Capt. J. B. Noel

6. CHANGTSE FROM THE CAMP ON THE CHANG LA

Cho Uyo Gyachung Kang

7. LOOKIN

7. LOOKING NORTH FROM 24,500 FEET ON THE NORTHERN RIDGE OF MOUNT EVEREST

Phot. by Capt. G. I. Finch

T EVEREST

Morshead Mallory Somervell Norton

Phot. by Capt. J. B. Noel

9. THE FIRST CLIMBING PARTY

8. THE EXPEDITION AT THE BASE CAMP

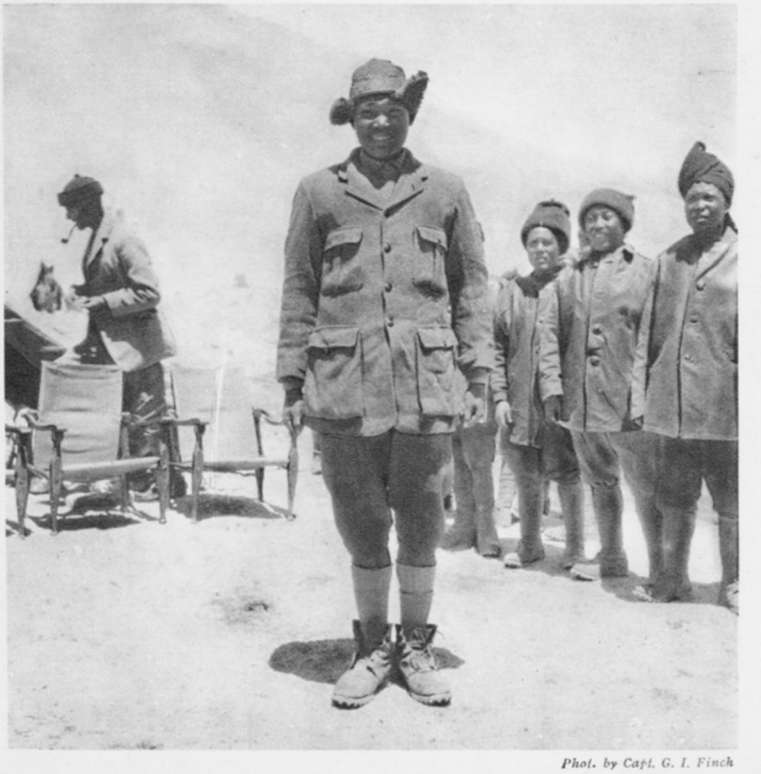
Geoffrey Bruce Finch

Phot. by Capt. J. B. Noel

10. THE BRITISH MEMBERS OF THE SECOND CLIMBING PARTY

Phot. by Capt. J. B. Noel

Tejbir



Phot. by Capt. G. I. Finch

11. TEJBIR THE GURKHA N.C.O. OF THE SECOND CLIMBING PARTY

Phot. by Capt. J. B. Noel

12. THE AVALANCHE TRACK OF JUNE 7, BELOW THE CHANG LA

Phot. by Capt. J. B. Noel

13. PARTY RESTING DURING THE ASCENT OF THE CHANG LA

Phot. by Capt. G. I. Finch

14. THE NORTH FACE OF SUMMIT OF MOUNT EVEREST FROM THE CHANG LA

Phot. by Capt. G. I. Finch

15. THE NORTHERN RIDGE OF MOUNT EVEREST FROM CHANG LA

Phot. by Capt. G. I. Finch

16. LOOKING WEST OVER PUMORI FROM 200 YARDS NORTH AND 100 FEET ABOVE THE CHANG LA

was out of the question. We dared not relax our vigilance, for ever and again all our strength was needed to hold the tent down and to keep the flaps of the door, stripped of their fastenings by a gust that had caught us unawares, from being torn open. We fought for our lives, realizing that once the wind got our little shelter into its ruthless grip it must inevitably be hurled with us inside it down on to the East Rongbuk glacier, thousands of feet below.

And what of my companions in the tent? To me who had certainly passed his novitiate in the hardships of mountaineering, the situation was more than alarming. About Tejbir I had no concern; he placed complete confidence in his sahibs, and the ready grin never left his face. But it was Bruce's first experience of mountaineering, and how the ordeal would affect him I did not know. I might have spared myself all anxiety. Throughout the whole adventure he bore himself in a manner that would have done credit to the finest of veteran mountaineers, and returned my confidence with a cheerfulness that rang too true to be counterfeit. By one o'clock on the morning of the 26th the gale reached its maximum. The wild flapping of the canvas made a noise like that of machine-gun fire. So deafening was it that we could scarcely hear each other speak. Later, there came interludes of comparative lull, succeeded by bursts of storm more furious than ever. During such lulls we took it in turn to go outside to tighten up slackened guy-ropes, and also succeeded in tying down the tent more firmly with our Alpine rope. It was impossible to work in the open for more than three or four minutes at a stretch, so profound was the exhaustion induced by this brief exposure to the fierce cold wind. But with the Alpine rope taking some of the strain we enjoyed a sense of security which, though probably only illusory, allowed us all a few sorely needed moments of rest.

Dawn broke bleak and chill; the snow had ceased to fall, but the wind continued with unabated violence. Once more we had to take it in turns to venture without and tighten up the guy-ropes, and to try to build on the windward side of the tent a small wall of stones as an additional protection. The extreme exhaustion and the chill produced in the body as a result of each of these little excursions were sufficient to indicate that, until the gale had spent itself, there could be no hope of either advance or retreat. As the weary morning hours dragged on, we believed we could detect a slackening off in the storm. And I was thankful, for I was beginning quietly to wonder how much longer human beings could stand the strain. We prepared another meal. The dancing flames of the spirit stove caused me anxiety bordering on anguish lest the tent, a frail shelter between life and death, should catch fire. At noon the storm once more regained its strength and rose to unsurpassed fury. A great hole was cut by a stone in one side of the tent, and our situation thus unexpectedly became more desperate than ever. But Tejbir still smiled, and Bruce's cheerfulness was not found wanting; so we carried

on, making the best of our predicament until, at 1 o'clock, the wind dropped suddenly from a blustering gale to nothing more than a stiff breeze. Now was the opportunity for retreat to the safety of the North Col camp. But I wanted to hang on and try our climb on the following day. Very cautiously and tentatively I broached my wish to Bruce, fearful lest the trying experience of the last twenty-four hours had undermined his keenness for further adventure. Once again I might have spared myself all anxiety. He jumped at the idea, and when our new plans were communicated to Tejbir, the only effect upon him was to broaden his already expansive grin.

It was a merry little party that gathered round to a scanty evening meal cooked with the last of our fuel. The meal was meagre for the simple reason that we had catered for only one day's short rations, and we were now very much on starvation diet. We had hardly settled down for another night when, about 6 p.m., voices were heard outside. Our unexpected visitors were porters who, anxious as to our safety, had left the North Col that afternoon when the storm subsided. With them they brought thermos flasks of hot beef-tea and tea provided by the thoughtful Noel. Having accepted these most gratefully, we sent the porters back without loss of time.

That night began critically. We were exhausted by our previous experiences and through lack of sufficient food. Tejbir's grin had lost some of its expanse. On the face of Geoffrey Bruce, courageously cheerful as ever, was a strained, drawn expression that I did not like. Provoked, perhaps, by my labours outside the tent, a dead, numbing cold was creeping up my limbs—a thing I had only once before felt, and to the seriousness of which I was fully alive. Something had to be done. Like an inspiration came the thought of trying the effect of oxygen. We hauled an apparatus and cylinders into the tent, and, giving it the air of a joke, we took doses all round. Tejbir took his medicine reluctantly, but with relief I saw his face brighten up. The effect on Bruce was visible in his rapid change of expression. A few minutes after the first breath, I felt the tingling sensation of returning life and warmth to my limbs. We connected up the apparatus in such a way that we could breathe a small quantity of oxygen throughout the night. The result was marvellous. We slept well and warmly. Whenever the tube delivering the gas fell out of Bruce's mouth as he slept, I could see him stir uneasily in the eerie greenish light of the moon as it filtered through the canvas. Then half unconsciously replacing the tube, he would fall once more into a peaceful slumber.

Before daybreak we were up, feeling fresh and fit, though terribly hungry. We proceeded to make ready for our climb. Putting on our boots was a struggle. Mine I had taken to bed with me, and a quarter of an hour's striving and tugging sufficed to get them on. But Bruce's and Tejbir's were frozen solid, and it took them the best part of an hour

to mould them into shape by holding them over lighted candles. Shortly after six we assembled outside. Some little delay was incurred in arranging the rope and our loads, but at length at 6.30 a.m., soon after the first rays of the sun struck the tent, we shouldered our bundles and set off. What with cameras, thermos bottles, and oxygen apparatus, Bruce and I each carried well over 40 lbs.; Tejbir with two extra cylinders of oxygen shouldered a burden of about 50 lbs. Our scheme of attack was to take Tejbir with us as far as the north-east shoulder, there to relieve him of his load and send him back. The weather was clear. The only clouds seemed so far off as to presage no evil, and the breeze, though intensely cold, was bearable. But it soon freshened up, and before we had gone more than a few hundred feet the cold began to have its effect on Tejbir's sturdy constitution, and he showed signs of wavering. Bruce's eloquent flow of Gurumuki, however, managed to boost him up to an altitude of 26,000 feet. There he collapsed entirely, sinking face downwards on to the rocks and crushing beneath him the delicate instruments of his oxygen apparatus. I stormed at him for thus maltreating it, while Bruce exhorted him for the honour of his regiment to struggle on; but it was all in vain. Tejbir had done his best; and he has every right to be proud of the fact that he has climbed to a far greater height than any other native. We pulled him off his apparatus and, relieving him of some cylinders, cheered him up sufficiently to start him with enough oxygen on his way back to the high camp, there to await our return. We had no compunction about letting him go alone, for the ground was easy and he could not lose his way, the tent being in full view below.

After seeing him safely off and making good progress, we loaded up Tejbir's cylinders, and, in view of the easy nature of the climbing, mutually agreed to dispense with the rope, and thus enable ourselves to proceed more rapidly. Climbing not very steep and quite easy rocks, and passing two almost level places affording ample room for some future high camp, we gained an altitude of 26,500 feet. By this time, however, the wind, which had been steadily rising, had acquired such force that I considered it necessary to leave the ridge and continue our ascent by traversing out across the great northern face of Mount Everest, hoping by so doing to find more shelter from the icy blasts. It was not easy to come to this decision, because I saw that between us and the shoulder the climbing was all plain sailing and presented no outstanding difficulty. Leaving the ridge, we began to work out into the face. For the first few yards the going was sufficiently straightforward, but presently the general angle became much steeper, and our trials were accentuated by the fact that the stratification of the rocks was such that they shelved outward and downward, making the securing of adequate footholds difficult. We did not rope, however. I knew that the longer we remained unroped, the more time we should save—a consideration of vital importance. But as I led out over these steeply sloping, evilly smooth slabs, I carefully

watched Bruce to see how he would tackle the formidable task with which he was confronted on this his first mountaineering expedition. He did his work splendidly and followed steadily and confidently, as if he were quite an old hand at the game. Sometimes the slabs gave place to snow —treacherous, powdery stuff, with a thin, hard, deceptive crust that gave the appearance of compactness. Little reliance could be placed upon it, and it had to be treated with great care. And sometimes we found ourselves crossing steep slopes of scree that yielded and shifted downwards with every tread. Very occasionally in the midst of our exacting work we were forced to indulge in a brief rest in order to replace an empty cylinder of oxygen by a full one. The empty ones were thrown away, and as each bumped its way over the precipice and the good steel clanged like a church bell at each impact, we laughed aloud at the thought that "There goes another 5 lbs. off our backs." Since leaving the ridge we had not made much height although we seemed to be getting so near our goal. Now and then we consulted the aneroid barometer and its readings encouraged us on. 27,000 feet; then we gave up traversing and began to climb diagonally upwards towards a point on the lofty north-east ridge, midway between the shoulder and the summit. Soon afterwards an accident put Bruce's oxygen apparatus out of action. He was some 20 feet below me, but struggled gallantly upwards as I went to meet him, and, after connecting him on to my apparatus and so renewing his supply of oxygen, we soon traced the trouble and effected a satisfactory repair. The barometer here recorded a height of 27,300 feet. The highest mountain visible was Cho Uyo, which is just short of 27,000 feet. We were well above it, and could look across it into the dense clouds beyond. The great west peak of Mount Everest, one of the most beautiful sights to be seen from down in the Rongbuk valley, was hidden, but we knew that our standpoint was nearly 2000 feet above it. Everest itself was the only mountain-top which we could see without turning our gaze downwards. We could look across into clouds which lay at some undefined distance behind the north-east shoulder, a clear indication that we were only a little, if any, below its level. Pumori, an imposing ice-bound pyramid, 23,000 feet high, I sought at first in vain. So far were we above it that it had sunk into an insignificant little ice hump by the side of the Rongbuk glacier. Most of the other landmarks were blotted out by masses of ominous yellow-hued clouds swept from the west in the wake of an angry storm-wind. The point we reached is unmistakable even from afar. We were standing on a little rocky ledge, just inside an inverted V of snow, immediately below the great belt of reddish-yellow rock which cleaves its way almost horizontally through the otherwise greenish-black slabs of the mountain. Though 1700 feet below, we were well within half a mile of the summit, so close indeed that we could distinguish individual stones on a little patch of scree lying just underneath the highest point.

Ours were truly the tortures of Tantalus; for, weak from hunger and exhausted by that nightmare struggle for life in our high camp, we were in no fit condition to proceed. Indeed, I knew that if we were to persist in climbing on, even if only for another 500 feet, we should not both get back alive. The decision to retreat once taken, no time was lost, and, fearing lest another accidental interruption in the oxygen supply might lead to a slip on the part of either of us, we roped together. It was midday. At first we returned in our tracks, but later found better going by aiming to strike the ridge between the north-east shoulder and the North Col at a point above where we had left it in the morning. Progress was more rapid, though great caution was still necessary. Shortly after 2 p.m., we struck the ridge and there reduced our burdens to a minimum by dumping four oxygen cylinders. The place will be easily recognized by future explorers; those four cylinders are perched against a rock at the head of the one and only large snow-filled couloir running right up from the head of the East Rongbuk glacier to the ridge. The clear weather was gone. We plunged down the easy broken rocks through thick mists driven past us from the west by a violent wind. For one small mercy we were thankful—no snow fell. We reached our high camp in barely half an hour, and such are the vagaries of Mount Everest's moods that in this short time the wind had practically dropped. Tejbir lay snugly wrapped up in all three sleeping-bags, sleeping the deep sleep of exhaustion. Hearing the voices of the porters on their way up to bring down our kit, we woke him up, telling him to await their arrival and to go down with them. Bruce and I then proceeded on our way, met the ascending porters and passed on, greatly cheered by their bright welcomes and encouraging smiles. But the long descent, coming as it did on the top of a hard day's work, soon began to find out our weakness. We were deplorably tired, and could no longer move ahead with our accustomed vigour. Knees did not always bend and unbend as required. At times they gave way altogether and forced us, staggering, to sit down. But eventually we reached the broken snows of the North Col, and arrived in camp there at 4 p.m. A craving for food, to the lack of which our weakness was mainly due, was all that animated us. Hot tea and a tin of spaghetti were soon forthcoming, and even this little nourishment refreshed us and renewed our strength to such an extent that three-quarters of an hour later we were ready to set off for Camp III. An invaluable addition to our little party was Captain Noel, the indefatigable photographer of the expedition, who had already spent four days and three nights on the North Col. He formed our rearguard and nursed us safely down the steep snow and ice slopes on to the almost level basin of the glacier below. Before 5.30 p.m., only forty minutes after leaving the col, we reached Camp III. Since midday, from our highest point we had descended over 6000 feet; but we were quite finished.

That evening we dined well. Four whole quails truffled in *pâté-de-foie gras*, followed by nine sausages, left me asking for more. The last I remember of that long day was going to sleep, warm in the depths of our wonderful sleeping-bag, with the remains of a tin of toffee tucked away in the crook of my elbow.

Next morning showed that Bruce's feet were sorely frostbitten. I had practically escaped; but the cold had penetrated the half-inch-thick soles of my boots and three pairs of heavy woollen socks, and four small patches of frostbite hampered me at first in my efforts to walk. Bruce was piled on to a sledge, and I journeyed with him as his fellow-passenger. Willing porters dragged us down until the surface of the glacier became so rough as to impose too great a strain on our slender conveyance with its double burden.

Our attack upon Mount Everest had failed. The great mountain with its formidable array of defensive weapons had won; but if the body had suffered, the spirit was still whole. Reaching a point whence we obtained our last close view of the great unconquered Goddess Mother of the Snows, Geoffrey Bruce bade his somewhat irreverent adieux with "Just you wait, old thing, you'll be for it soon!"—words that still are expressive of my own sentiments.

THE MOUNT EVEREST PHOTOGRAPHS

THE photogravures from this year's photographs published in the October *Journal* were concerned mainly, though not entirely, with the journey from Darjeeling to the Base in the Rongbuk valley below the snout of the main glacier. In this number, which contains the account of the two record-breaking high climbs, we publish a second series illustrating more particularly the alpine climbing and the personnel of the expedition.

Plate 1 shows the east Rongbuk glacier above Camp II., looking up to the south-east. Last year the climbing party came over the Lhakpa La at 22,500 feet, lying somewhere behind the hill in the centre of the picture, and crossed the smooth upper glacier to the Chang La. The route was not difficult, and the Kharta valley was a much more favourable camping-ground than the Rongbuk. But there was always the danger of a 22,500-foot pass in the line of communication and retreat; whence the preference this year for the East Rongbuk route, despite the frightful séracs and the great medial trench described by Colonel Strutt, and very well shown in this picture. The route lies along the foot of the moraine slope to a point near the right-hand edge of the picture, and then strikes out through the séracs to the centre.

Plates 2 and 3 are enlarged from two V.P.K. negatives made by Mr. Somervell. They are taken much higher than any photographs were ever before made on the Earth's surface, and they are the only photographs

made above about 24,000 feet on this year's expedition. We understand that Mr. Somervell exposed several other films at Camp V., and spoiled them in development. Captain Finch found it impossible to give any attention to photography in the upper stages of his climb, though he took some excellent pictures from about 24,000 feet, reproduced later. Mr. Somervell's pair taken close to 27,000 feet are therefore of particular interest and importance. They show that the way to the summit is rough and dangerous from the unfavourable disposition of slabs lightly covered with snow; but there are no serious climbing difficulties except possibly on the 500 feet below the summit. The point reached by Finch and Geoffrey Bruce is included in Plate 3, a little above the centre of the picture and a little to the right of what appears to be the summit, though the true summit lies a little further back.

Plates 4 and 5 were taken by Captain Finch. The first shows a frostbitten climber from the second high climb being helped down through the séracs; the second an oxygen party resting at Camp IV. on the ice-ledge below the Chang La. The fantastic surroundings of this camp are admirably seen in Plate 6, looking north over Camp IV. to the Changtse. Mr. Mallory's account relates how on the first climb the party were stopped at once by a crevasse, and had to retrace their steps some distance northward before they could find a way on to the col. The track is dimly shown in the shadow above the tents, leading up towards the precipitous western edge of the col.

Plate 7 is made by joining two photographs taken by Captain Finch from about 24,500 feet on the northern arête. On the left one looks down to the head of the main Rongbuk glacier and across the West Rongbuk towards Gyachung Kang and Cho Uyo. Pumori on the left is hidden in clouds which conceal also the solution to the still undetermined problem: Where is the head of the West Rongbuk glacier, and where does the watershed lie? Evidently two important branches of the glacier descend from the Cho Uyo group; but the topography here is still unknown, and the principal head of the glacier may yet be found to lie close to the Khombu La. The long ridge of Changtse in the centre of this plate looks more precipitous than it really is, because the camera was tilted downwards to show the glaciers. And over the ridge we can see the "light rock peak" of Kellas which remains unnamed, and all the range of peaks lying east of the East Rongbuk.

Plates 8, 9, 10, and 11 show the two climbing parties, Lance-Naik Tejbir belonging to the second. The figure in the long picture of the whole party, above Finch and between Geoffrey Bruce and Somervell, is Mr. John Macdonald, son of the British trade-agent at Gyantse, who had come up with a consignment of money and remained some weeks with the party.

Plate 12 shows, a little to the right of the centre, the track of the avalanche that overwhelmed the third attempt, with the ice-cliff over which

the porters were carried. Plates 14 and 15, from photographs by Captain Finch, have been marked to show the approximate sites of Camps V. and VI. and the higher points of the two high climbs. The pictures overlap, but are tilted rather differently and cannot be joined accurately. It has therefore seemed best to reproduce them separately. They give a striking representation of the bare and unattractive northern face before the monsoon snow has whitened it.

The last picture, No. 16, is geographically important, since it shows clearly for the first time the glacier running down into Nepal from the ice-col at the head of the main Rongbuk. This glacier comes out of the western cwm, and Mallory looked down it in 1921, but bad weather made his photograph rather unsuccessful. We see here that the watershed runs over this col and over Pumori. What happens to it later will not be known until a third expedition is able to devote a little time and energy to geography.

GEOLOGICAL NOTES FROM THE OXFORD EXPEDITION TO SPITSBERGEN

N. E. Odell

(*Contributed to the discussion following Mr. Frazer's paper, p.* 335.)

THE dominant character of the mountains around Klaas Billen Bay is their terraced structure due to the horizontally bedded Carboniferous rocks and the varying hardness of their component zones. These zones include limestones, chertz series, gypsiferous series, and kulm sandstones. Pronounced block-movements have given rise to plateaux, valleys, and fiords. The Carboniferous rocks rest unconformably on a complex base of granites and gneisses with, possibly, metamorphosed sediments. This complex comes to the surface only on the north side of the Nordenskiöld Glacier and in the base of Mount Terrier, where its vertical foliation and strike are well exposed. The main point of interest about this occurrence in Mount Terrier is the nature of the unconformity between the Carboniferous series and the basement complex. It consists of a great plain sloping slightly westwards, and it would appear to be part of a great "base-level" plain, such as that of Cretaceous age traced by Baron De Geer over the greater part of Spitsbergen. I found sandstone beds, but no conglomerate, resting directly on this plain along the whole south face of Mount Terrier, and from this and other considerations it would appear that it forms part of a great eroded surface of Middle-Carboniferous age. Looking east from the high interior of "Garwood Land," the flat-topped ranges to the north of Mount Svanberg at once suggest themselves as the continuation of this great plain of erosion.