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THE MOUNTAINS OF NORTHERN SIKKIM AND GARHWAL.

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A LONG the northern border of India stretches the most stupendous mountain barrier in the world. The main axis of the series of parallel ranges and mountain masses known collectively as the Himalaya extends for over 1500 m. from E. to W. and only comparatively small sections have so far been explored. The present paper deals with those divisions which cover the northern portions of Sikkim and of Garhwal, and is essentially a continuation of the explorations carried out by Mr. Freshfield and by Dr. Longstaff's party, and reported upon to this Club.

Sikkim is a small state about 2700 sq. m. in area lying between Nepal and Bhutan. To the S. lies the district of Darjeeling or British Sikkim, from the capital of which one generally starts when visiting the mountains to the North.

It may be well at the outset to enter briefly into orographical detail. The chief mountain of this portion of the Himalaya is the five-peaked Kangchenjunga, which rises to 28,150 ft.: it is probably the second as regards height and the first as regards mass of the measured mountains on the earth's surface.

The group of which Kangchenjunga is the chief is roughly speaking enclosed between the sources of the Teesta on the

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E., and the Arun river on the W. Its backbone runs nearly N. and S., forming the boundary between Sikkim and Nepal, and is crossed at right angles by three ridges running E. and W.

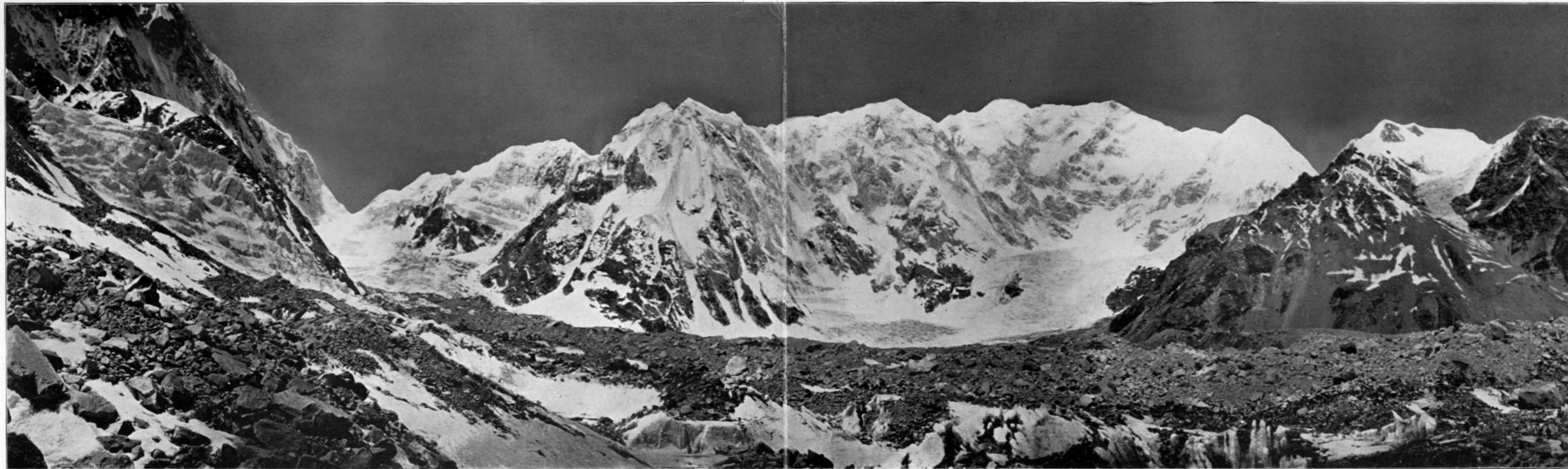
On the southernmost range which forms the northern skyline of the famous Darjeeling view rises Kangchenjunga itself, flanked by Simvu (22,360 ft.) and Siniolchum (22,620 ft.) on the E., and Jannu (25,310 ft.) on the W. Between it and the central range lie the two greatest glaciers of the group, the Zemu to the E., and the Kangchenjunga to the W. N. of the Central Ridge which meets the N. and S. axis in the Tent Peak (24,100 ft.) lies the broad shallow trench known as Lhonak. The range bounding Lhonak on the N., which forms the Tibetan boundary for a considerable distance, contains several lofty peaks: notably Chumiomo (22,430 ft.), the Kangchenjhau (22,700 ft.), and Pawhunri (23,180 ft.).

About the middle of April of last year (1911) I left Darjeeling with forty-four coolies, and in eight days reached the village of Lachen, which is about 110 m. N. of Darjeeling by road. The scenery of the foot-hills passed through on the way has been so thoroughly and interestingly described by Mr. Freshfield and the late Sir Joseph Hooker that we may start our journey at Lachen.

Having sent on a considerable quantity of stores to Thango, about 12 m. to the N., I left Lachen on April 24 with thirty-one coolies, eight of whom were Sherpa Nepalese who were to remain with me permanently, the remaining twenty-three being Lachen men who were to return after four days' march to the N.W.

At Zemu Samdong (Zemu Bridge) about 2 m. N. of Lachen, one leaves the pony track leading to Thango and Tibet, and proceeds through forest along the side of the Zemu River which we follow to its source (about 15 m. off) in the glacier of the same name. This short distance is generally counted a three days' march on the upward journey, as the route is very rough.

Many different types of animals are met with in these upper valleys above 10,000 ft. A large troop of monkeys was seen near Zemu Samdong, and the Lachen men lassoed a beautiful mountain fox a few miles further on. They wished to sell me the animal, declaring that its skin would fetch a considerable sum in Calcutta, but released it on my refusal. I was glad that they did not kill the creature for its long fur, which was a beautiful brown and black. It would be better if only dangerous predacious creatures like bears and wolves or game



27,800 ft.

28,150 ft.

A. M. Kellas, photo

Zemu Gap, 19,300 ft.

PANORAMA (142°) OF THE EAST FACE OF KANGCHENJUNGA (28,150 ft.).
[Taken from S. bank of Zemu Glacier at 16,000 ft.]

Swan Electric Engraving Co., Ltd.

which is plentiful like hares were killed in these upper valleys for some time. The Government is fortunately restricting the number of each of the different species of animals which may be shot on one gun licence.

In the afternoon we were stopped at the Lhonak Chu, a tributary of the Zemu, the bridge over which was down. Next morning a primitive bridge having been made from a few tree trunks, we crossed and proceeded as far as the Tum-rachen Chu, a bridge over which we built that day. On April 26 we reached the end of the Zemu Glacier, our course for the greater part of the day being over avalanche snow, which had filled up the lower part of the valley, the river finding its way underneath. We had already passed about a dozen snow bridges. To the S. towered the crags of the Lama Anden (19,250 ft.).

On the fourth day from Lachen (April 27) we crossed the Zemu Glacier, and advanced to within 3 m. of the Green Lake, camping in a thunderstorm accompanied by heavy snow. Some of the flashes of lightning were very brilliant, and the thunder seemed to roll from end to end of the chain to the S. Now and again a loud crash without reverberation was heard as if an ice field had split. The twenty-three Lachen men were paid off immediately, as they desired to descend the valley for some distance that night although it was quite dark (7 P.M.).

The storm stopped about midnight, but throughout the rest of the night there was a constant flicker of lightning along the southern horizon, and frequently in the course of the next few weeks we noticed similar phenomena, as if there was continual friction between plain and mountain air currents.

On advancing to the Green Lake we found the greater portion of the region deep in snow, and the Green Lake itself was only half its summer size, the eastern half being a muddy flat.

Our first object was to find a pass suitable for laden coolies over the mountains to the N., which rise to a little over 20,000 ft. We made five attempts, but only managed to force two passes, one of which was suitable for coolies. We began with two frontal attacks. The first attempt was made on a ridge leading up to a small snow peak N.E. of the camp, but after ascending to 18,000 ft. we found it to be unsuitable for coolies, but practicable for a roped party.

We next tried further to the W. close to Green Lake Mountain, but a heavily crevassed glacier was met with, passable with difficulty by laden coolies in the area investigated. Here I was partially incapacitated for some days through slipping on

glazed rocks. The accident was due to an experiment with boots two sizes too large with two pairs of socks, admirable for wading in deep snow in the early morning but quite unsuitable for rocks.

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

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

An easier route than that up the Tent Peak Glacier seemed to lead N. Eastwards up a tributary glacier coming down from a plateau which obviously connected with Lhonak. The Nepal Gap to the W. seemed so easy of access that we could hardly credit that there must be a rise of about 5000 ft. from our camp to its summit.

On the following morning at 6 A.M. we started for the Nepal Gap instead of attempting the pass, because I was still a semi-invalid from the accident of three days before, and had on the previous day required considerable help from the rope in



A. M. Kellas, photo.

Sugarloaf Peaks (22,700 ft. ?).

The Tent Peak (24,100 ft.).

Tent Peak Pass (19,000 ft.).

Swan Electric Engraving Co., Ltd.

PANORAMA (142°) OF THE TENT PEAK AND ITS GLACIERS.
[Taken at elevation of 16,500 ft.]

ascending the icefall. We had to cross the main Tent Peak Glacier, and proceed up its western branch, which might be distinguished as the Nepal Gap Glacier. In about a couple of miles we came to an awkward icefall which took us nearly 2 hrs. to negotiate. It was far more difficult than when visited on two previous occasions (1907 and 1909), the arrangement of the seracs having entirely altered. We went right up through the centre of it, some gymnastics being required. Deep troughs containing ice-covered lakelets constituted one of the main difficulties. Above the icefall I had expected that we would proceed rapidly, but the crevasses were more numerous than expected and progress was slow. Tuny, who was leading, spent too much time in exposing narrow crevasses, but one hardly liked to correct him, in case he might go to the opposite extreme, and at 2 P.M. we were still some distance from the pass. Up to this time the glare of the sun had been very trying, the heat being terrific, but quite suddenly on reaching about 20,000 ft. we passed into an icy cold wind, which was pouring through the gap from the W. The sun became obscured, mists were sweeping up, and the coolies wished to turn back. As we had been as far in 1909, one had to refuse. Progress after that was slow. The wind coming through the gap became a gale and was piercingly cold. The snow was frozen on the surface, but soft beneath and we sank nearly to the knees. The coolies complained of incipient frost-bite, and we had to stop until they had rubbed their feet, and put dried grass, of which they carried a small supply, into their boots. About 3.15 we reached the base of the small rock wall at an elevation of 20,850 ft. which formed the summit (21,000 ft.). This ridge was not difficult on the right, and although we were all extraordinarily tired, probably because we had done too much in the preceding week, I was strongly averse to turning back without climbing it, but Sona showed me that a few of his toes looked white and numb, and to climb the wall might have taken at least half an hour in our exhausted condition. We therefore retreated as rapidly as possible, but owing to our meeting with a second set of seracs below the icefall, we were delayed nearly three-quarters of an hour, and did not reach our camp until 6.30 P.M. In 1907 and 1909 there were no seracs in that position, and imagining we were past all danger we had taken off the rope. We did not put it on again, but it would have been better to have done so. One would strongly recommend anyone attempting to cross the Nepal Gap, and probably the other side is not impossible, to camp

above the main icefall of the Nepal Gap Glacier so as to leave plenty of time for the upper portion. The map is wrong with regard to the connection between the 'Sugarloaf' and 'Twins' Groups. These are separate and connected by a low Col.

On the second day after attacking the Nepal Gap, having moved the camp up about 500 ft., we proceeded to attempt the pass into Lhonak. The great icefall having been surmounted, we turned up the centre of the glacier on the E. To begin with there were several deep and broad crevasses, but we found crossing places and proceeded rapidly. We seemed to have surmounted all the difficulties when we came to a large crevasse which we just managed to leap at one point. A couple of hundred yards further on, however, we found ourselves cut off by an enormous gap. On each side, too, were impassable crevasses. We were on a huge isolated rectangular mass of ice. Retreating on our tracks for about a quarter of a mile, and proceeding to the left, we found ourselves on an ice slope. Cutting zigzags up this we reached a narrow edge about fifty yards long which was probably the most difficult mountaineering work tackled in our entire expedition. On each side were steep snow and ice slopes ending in crevasses. Tuny, as being by far the best step-cutter, was sent to the front after instructions to make big steps and turn out his toes. I am confident that few first-rate Swiss guides could have equalled him in steadiness and the admirable character of his steps. This knife-edge was certainly more sensational than is generally allowable when with coolies. After getting beyond the crevasses, the route followed was comparatively easy, but the pass was far off towards the edge of the slope which descended steeply to Lhonak. It was merely a tramp of $1\frac{1}{2}$ m. through soft snow with very few crevasses. The view from the summit was interesting. Due N. was the Chortenima La practically free from snow on its S. side. To the W. lay the Langpo and Pyramid Peaks. The pass has been named Lhonak La and its elevation is about 19,500 ft. As it was only 1 o'clock I wished to descend to Lhonak, and force our way back over the gap which lay at the head of the Tent Peak Glacier, it being at least 500 ft. lower than our pass. We would thus miss the knife-edge, which would be more dangerous on the descent. The coolies while anxious to miss the knife-edge were strongly against the idea and I thought it well to give in. Sona, who, as I learned by experience, was rather a pessimist, declared that the other side of Tent Peak Pass was a sheer precipice, and that we would be benighted without food



A. M. Kellas, photo.

The Pyramid (23,400 ft.).

(Langpo Peak (22,800 ft.).

VIEW TO THE NORTH-WEST FROM NEAR THE SUMMIT OF LHONAK LA (19,500 ft.).

[Panorama (142°).]

Swan Electric Engraving Co., Ltd.
Chorten Nima La (18,500 ft.).

or shelter. Descending rapidly to the knife-edge we rested before passing it. Evidently the steps had suffered from the sun, and some would require repairing. Sona turned to me just before we started and said 'How many men?' a rather cryptic remark he usually made when we were in what he considered to be a dangerous position. As far as I could understand, he meant 'How many men will get through?' I reassured him, and put Tuny as leader, telling him to freshen the steps if necessary. Tuny's leading was simply perfection. With a few well-directed blows he remade the steps, so that we passed without serious danger. On the ice slope below, however, Sona slipped out of the ice steps. Only one man was moving at a time, and I found that I could hold him fairly easily. In any case we would only have shot down about 200 ft. and there was no crevasse immediately at the bottom. On returning to our camp Sona and Tuny were emphatic in their decision that no laden coolie could traverse the pass. It must be pointed out, however, that if we could have pursued our way up the centre of the glacier, the pass would have been easy. We had so far as we saw got over all the main difficulties when stopped by the impassable crevasse, and glaciers alter rapidly in the Himalaya. Perhaps one might explain here that the criticisms of the coolies given in this paper are intended in the most friendly spirit. Taking everything into consideration the men behaved as well as could have been expected.

On investigation next day it was found that Tent Peak Pass was an easy snow slope on the N. side, and exclamations of 'achchha' (good) were heard in the camp throughout the evening. The coolies were delighted because, if we could not have managed the Tent Peak Pass, they might have had to carry the baggage over the Changthung and Thé passes about 15 m. to the E. As it would have taken between two and three weeks by that route, since there were more than three loads to each coolie, the saving of time and trouble was considerable. Four coolies were told off to move the baggage under Tandook's direction over Tent Peak Pass, while the other three, including Sona and Tuny, came with me to attempt the Zemu Gap and Simvu Saddle, on the South side of the Zemu Glacier.

Our plan was to ascend to the Zemu Gap, descend to near the Guicha La, force a pass to the Passanram Glacier, and return to the Green Lake over the Simvu Saddle.

Crossing the Zemu Glacier we camped for the night on a

sheltered bank partly covered with dwarf juniper about 2 m. W. of the N. Simvu Glacier. This was the only place of its kind for many miles, the last outpost of plant life in that wilderness of rock and snow. Next day we proceeded to an altitude of about 18,200 ft. in the Zemu Gap. Our route at first lay up the E. side of the Zemu Gap Glacier. Towards 8 o'clock we found ourselves forced on to the side of Simvu by crevasses, and others barred further progress in front. A traverse to the right and short ascent showed us that all the crevasses had been turned, and that the remaining 1100 ft. should present no difficulty. The night was bitterly cold with wind and drifting snow. At 5 A.M. I roused the coolies, but the cold was so intense that they soon rushed back into their tent and covered together. On my protesting they declared it impossible to do anything in such cold, and that we would have to wait until the sun reached the tents. This would not occur until between 9 and 10 o'clock, as the sun would have to rise above a lofty buttress of Simvu. The manœuvre of retreating to their tent was repeated a second and third time, and I began to lose patience. It should be explained that they had been given on the preceding night two large down quilts, so that they were as well protected as myself—I did not use a sleeping bag—and they were wearing quite as much clothing. Eventually we got away about 8.30 A.M. just as banks of mist began to sail up the Zemu Glacier. Going at full speed and halting only once for a few minutes, we reached the top of the gap (19,300 ft.) about 9.30 A.M., our pace being considerably over 1000 ft. per hour. The going would have been very easy, had it not been for six inches of snow which had fallen in the night, and which in places had blown into wreaths. Half an hour before we reached the top, however, grey mists were sweeping through it, and from the summit, which was only a few yards across, the view was spoilt by mist. An icy wind blew through the gap and it snowed intermittently. The slope fell away steeply in front, and a few yards down there was a crevasse which stretched right across the gully.

After waiting for an hour, only rewarded by a glimpse of a great white peak (presumably Pandim) through a rent in the clouds, as it seemed too hazardous to attempt a descent with heavily laden coolies through mist, we retreated and proceeded to our old camping place near the Simvu Glacier. On the way the view of the crags of Kangchenjunga was very imposing, and we noted that the N.E. buttress seemed almost inaccessible

and would in fact require difficult climbing to get properly on to it, as it degenerates into a narrow rock ridge which rises at the end into a small peak. On the following day we ascended to the summit of the Simvu Saddle (17,700 ft.). The climb was merely a walk along the W. side of the Simvu Glacier, and could have been made the whole way unroped. At the bottom of the glacier, about 1½ hrs. from our previous camping place, the coolies wanted to halt for the night, promising to start at 4 A.M. next morning. Referring to their behaviour on the previous day at the Zemu Gap, I jokingly suggested that it was not 4 A.M. they meant but 10 A.M., whereupon they laughed good-naturedly, and we went on to the summit. This incident indicates one secret of how to deal successfully with coolies, who usually have a weakness for wanting to camp about an hour after starting in the morning. Mist was sweeping up from the S., when we reached the top at 3 P.M. The descent was much steeper in that direction than to the N., and was blocked by an icefall about 250 yards down. We camped about 100 yards from the icefall. Towards evening the mists cleared except to the S., and there was a magnificent sunset over Simvu and the crest of Siniolchum. The W. side of the latter mountain is very precipitous, but may not be quite impossible. The air was moist, and a camera left for a time exposure for a few minutes was covered with a thick deposit of ice crystals.

On the following morning we carefully surveyed the icefall, and came to the conclusion that it was practicable for a roped party of loaded coolies, but that great care would be required, especially on the descent. Fine views were obtained from the summit both to the N. and S., but the latter direction was quickly obscured by mist. We unfortunately had not enough provisions to descend the icefall, cross a ridge, and attack the Zemu Gap from the S. as one would have liked. The weather too was stormy, and we therefore decided to cross the Tent Peak Pass and join our other party in Lhonak. The afternoon of the following day found us camped on the summit of Tent Peak Pass. The route is quite easy. On the final ascent to the pass there are several large crevasses, so that coolies must be roped. We had intended to join Tandook that night, but the weather being bad we camped on the summit (19,000 ft.), so as to get photographs on the following morning. Snow fell at intervals during the night and continued next morning. While we waited patiently for the mists to lift, three coolies of Tandook's section came up to remove some baggage we found

on the pass. They informed us that Tandook was camped 2 miles to the N.

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

On the afternoon of May 18 the camp was moved down beyond the end of the N.E. Langpo Glacier, which is incorrectly given in the map, and on the following day after crossing a ridge and passing a small lake, we camped in the afternoon by the Langpo Chu, just at the bottom of the descent from the Chorten Nima La. As it was still early, coolies were sent back to near Tent Peak Pass to bring up the rest of our baggage, and with three coolies we ascended the great glacier bank on to the plateau which leads to the S. ascent of the pass. Next day we crossed, getting a magnificent view from the summit. Our intention was to ascend the fine peak which guards the pass on the E., and which we have provisionally named 'Sentinel Peak.'

About 7.30 A.M. on May 21 we started on the ascent. Our route lay chiefly up toilsome scree slopes for about 1500 ft. when we reached a crevassed snow slope. From the moment we reached snow we had to cut steps, although it was only *névé*. Very soon we were stopped by a wide crevasse, but on traversing horizontally for about 200 yards we found a narrow bridge,



A. M. Kellas, photo.

Swan Electric Engraving Co., Ltd.

(Lower row) Tuny

Tandook
(*Sirdar*)

Sona

GROUP OF SHERPA NEPALESE COOLIES.

and after that there was little difficulty. First we proceeded S. towards what looked like the summit, but near this another higher summit appeared on the left. On reaching that, however, we found it to be merely the heavily corniced edge of a precipice which plunged down to a large glacier on the E., and a third summit appeared as a sharp snow peak right in front. It was now about 1.30 p.m. and the coolies were discouraged. Tuny, who had cut steps the whole way, confessed to being exhausted and Sona was pessimistic as usual, but after a rest they agreed to come up to the top. Unfortunately a small portion of the arête was green ice, and necessitated careful step-cutting, so that it was past 3 before we reached the summit (about 22,000 ft.). The peak has probably not been triangulated, but it may be the peak marked 22,060 ft. and perhaps misplaced on the map. The last portion was soft new snow, the slopes on each side being steep. It was misty and snowing when we reached the top, and after a halt of only a few minutes we had begun to descend when the mist was blown aside and we got a fine view. It appeared that we had been at the end of a nearly horizontal narrow crest, but whether the other end was a few feet higher or lower, I was unable to make out. It was obvious that glaciers occupied the defiles to both E. and W. instead of rivers as marked on the map. Mr. Freshfield has already pointed out how inadequately the Himalayan Glaciers have been treated in the survey maps, and from what we saw here and in other places near the southern boundary of Tibet, the area under glaciers as represented in the latest map of Sikkim (1906) showing adjacent parts of Nepal and Tibet, should be nearly doubled.

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

Next day found us on our way to the Jonsong La (20,300 ft.) (traversed by Mr. Freshfield's party in 1900), which was crossed on the following day, and our camp pitched at about 19,000 ft. near the S. Langpo Glacier. From this position we had in 1909 ascended the Langpo Gap and also the Langpo Peak. Our present intention was to repeat the ascent of the Langpo Peak, which was particularly easy in 1909, and from the summit decide on a route up the Jonsong Peak (24,400 ft.) and more especially to investigate the summit arête of that mountain.

In August 1909 the ascent was similar as regards difficulty to that of the Zermatt Breithorn from the Leichenbretter Hut

with the exception that the last 600 ft. was steeper than anything on the Breithorn. From the denuded appearance of the mountain, as seen from the Jongsong La—there is more snow below and less snow above 19,000 ft. in May as compared with August—we were afraid that the final 1000 ft. might be icy and difficult. This proved to be the case. The mountain at this early season of the year was considerably more difficult than the Finsteraarhorn *via* the Hugi Sattel.

On May 25 we started, intending to camp between the Langpo and Langpo Chung Peaks. From our experiences on the Nepal Gap Glacier, and also near the summit of the Jongsong La, where a coolie was only saved from falling into a crevasse by the large pack of firewood he was carrying, I insisted on roping on the S. Langpo Glacier, and had reason to be most devoutly thankful that I had done so. Near the head of the comparatively level portion of the glacier there is a rise of about 400 ft. and in the middle of this Sona, who was leading, suddenly disappeared. Tuny, who was next, and too close to him, stopped with a startled cry. In front of Tuny the rope disappeared into a great blue cavern. Moving steadily backward first Sona's pack appeared, and then he himself was drawn out in a very dishevelled condition, and minus ice-axe and hat. I was glad to find that he quickly recovered from his alarm and was quite ready to proceed. As neither axe nor hat could be readily replaced an attempt was made to recover them. After some time Tuny discovered them in a crack between 30 and 40 ft. down, where the crevasse abruptly narrowed from about 10 to 5 feet; beyond this crack the crevasse continued to unknown depths. By lowering Tuny we were fortunate enough to secure both hat and axe. Of course I pointed out that the accident would not have occurred had Sona been leading properly, and, as was to be expected, the experience was most useful to us. Tuny's main fault, as had been indicated to him several times, was a tendency to get too close to his neighbour in places which looked easy, while Sona's faults included a reckless carelessness, which he had been warned would end in accident. After this they both greatly improved. In 1909 I led on nearly all ascents, but experience taught me that it was better for the coolies to do most of the leading.

Near the top of the S. Langpo Glacier we turned to the right and proceeded up a broad steep slope under ice cliffs to the Col. This slope had been an easy uncrevassed climb in 1909, but now a few crevasses ran practically right across it, and this

caused delay. Eventually we reached the Col just after sunset. It had taken us 7 hrs. from our camp ; in 1909 we did it on each of two occasions in $2\frac{1}{4}$ hrs. Our troubles were not ended. After nearly half an hour spent in fruitless attempts to pitch our tent in a freezing gale, we were ignominiously forced to retreat and camp at 20,700 ft. in deep snow about 300 ft. below the saddle.

It snowed during the night, and the weather next morning was bad. Mist was blowing up even at 8 A.M. when we started. Before we left the saddle it again began to snow and the wind was very keen. We climbed slowly and the coolies were evidently discouraged by the weather. At about 22,000 ft. they wanted to turn back, and all baggage was left behind except a camera. We were hampered on most of our climbs by carriage of bottles for estimation of carbon dioxide in air. The remaining 900 ft. looked distinctly formidable. It was difficult to credit that the gaunt cone in front corresponded to the blunt wedge ascended in 1909. There was, too, a greenish shimmer over the whole face which indicated hard ice, the mountain being obviously in an exceptionally difficult condition. It took us 3 hrs. to cut our way up the next 600 ft., although the first 200 ft. was only hard névé. The coolies evidently could not understand why anyone should persist in going on in such weather, and during the showers of hail we had to halt. We had cut back on the arête, and were proceeding up it, when we met with a crevasse which would have necessitated cutting back on to the face and zigzagging to the top. Unfortunately, however, it snowed and the coolies clamoured for descent. Apparently nothing was to be gained by proceeding, as the Jonsong Peak had been shrouded in mists for some time, so that after taking a photograph in a lull of the storm we turned back. We were within 250 to 300 ft. of the top. It was very annoying to have to retreat in the circumstances, but one gets accustomed to disappointments of this sort in the Himalaya. If we had all had crampons we could have reached the summit in half the time we had taken.

It took us about $1\frac{1}{4}$ hrs. to descend the 600 ft. of the final peak, only one man moving at a time in certain places. Tuny went first, then came Anderkyow, third Sona, and last the only man with hobnailed boots, which was of course the proper place for him in the circumstances. It was abundantly proved during this portion of the descent that the cloth boots worn by the coolies were not satisfactory on ice. It was misty and

snowing and it was difficult to keep the ice steps clear. Twice Sona fell out of the ice steps, and on the second occasion he very nearly pulled me down, because he was so long—probably at least twenty seconds—before he managed to wriggle back into them. We were back at the camp at 4 o'clock, having experienced dense mist all the way.

On mentioning to Sona that another attempt might be made next day, so as to get photographs from the top, he coolly replied—'The coolie-men have no Khana (dinner), Sahib, and we must go down to-morrow,' and on inquiry we found that they had not taken so much provisions with them as instructed, and that they had finished all their food that morning. Nothing could be done but descend, which, strongly against the coolies' will, I insisted on doing that night in spite of mist and snow. It was quite dark when we arrived at our camp near the foot of the S. Langpo Glacier. The coolies soon forgot their troubles over tea, biscuits and meat. The weather continued bad for the next two days, mist enveloping our camp a great portion of the time. On the third day we descended the S. Jonsong Glacier and turned N.W. up a glacier provisionally named Long Ridge Glacier from the mountain on the W. A pass at the N. end of this mountain looked easy, but on investigation on the following day was found to be of the writing-desk type, a long easy slope to the E. and a fairly sharp precipice to the W. When we were on the summit of the pass the coolies pronounced the descent impossible, but on the following morning, after a little persuasion, three coolies agreed to come with me and attempt the descent.

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

The ascent of the pass was not difficult, although there were several awkward crevasses. The descent was however very steep—probably at least an angle of 60° to 70° —and was made unroped, the coolies greatly preferring that arrangement; the rope would have been cut to pieces on the sharp rocks, so that I was quite agreeable. A stone tossed from the summit would

have fallen on snow 500 ft. below. A few small gullies filled with glassy ice were troublesome, requiring careful step-cutting. After descending we crossed a glacier and camped on rocks about a mile to the W., under the precipices of a sharp isolated peak of the Jonsong group which we have provisionally named 'The Outlier.' It is probably about 22,500 ft. high. From our camp we had a magnificent view of the N.W. face of Jannu, which looked like a great cathedral with twin towers.

Next morning we proceeded along the glacier, which ended abruptly in the most peculiar way at a corniced edge to a precipitous descent leading down to a glacier about 1500 ft. below us. It was a regular 'cut-off,' and a discussion and delay followed. We had not expected anything of the kind. The route seemed impassable for laden coolies in front, and the head of the glacier below us was barred by cliffs. Beyond the great trench in front was an array of peaks and passes. The coolies asked me point-blank which was the Chabuk La, and I had to confess that I did not know. We had only two days' provisions and were probably at least four days from the Chorten Nima La by that route. The map was hopelessly wrong, showing the unknown marvel of a river flowing in at the head of a glacier as being in front of us. The person who mapped this portion of the range seems to have been mentally related to the 'scientist' mentioned in Mr. Freshfield's 'Caucasus' who undertook to prove that there were no glaciers at all in the Himalaya. To advance further with heavily laden coolies seemed unfair to them, but I regret now that we did not seek another route of descent and make the attempt. We could have hidden some of our baggage and sent back for it if necessary, but the idea did not occur to me until it was too late. As usual the weather gave the casting vote, so to speak. The clouds which had been massing round Jannu all the morning blew up with astonishing rapidity and it began to snow. Reluctantly the order to retreat was given, and we returned to our old camp. In the afternoon a fine avalanche fell from 'The Outlier,' which I was fortunately able to photograph. The clouds of snow dust look like mist.

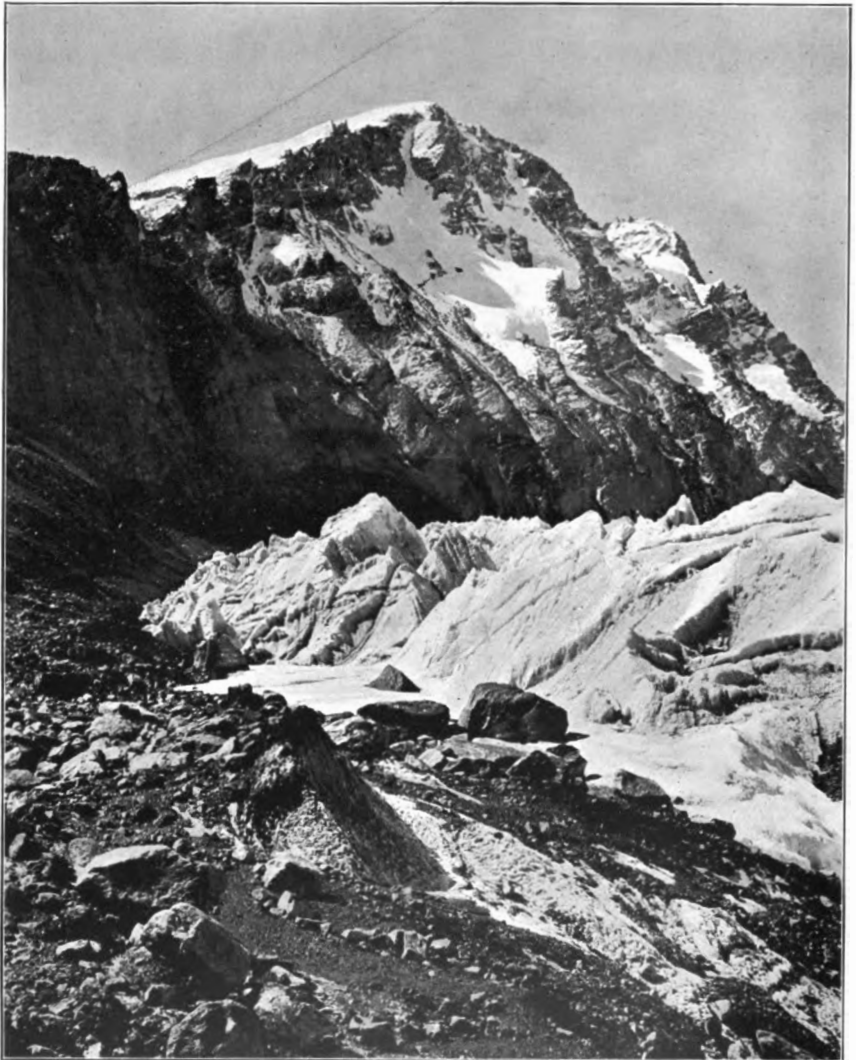
On the following morning we crossed Long Ridge Pass and reached our old camp by the Langpo Glacier, and next day crossing the Jonsong La, we reached Tandook's Camp at the foot of the slope leading to the Chorten Nima La. Taking two fresh coolies two days afterwards we were at Thango having crossed the Lungnak La.

Only one incident occurred, and from the mountaineering point of view it is worth relating. At the foot of the rocks of Long Ridge Pass I indicated to the coolies as clearly as I could that we must all keep close together, otherwise there might be danger from falling stones. The coolies, however, went at such a pace that they quickly gained on me. It was not that it would have been impossible to go at their rate, the height being only 19,000 ft., but simply that I did not want to go so fast, as I wished as usual to keep well within my powers, and to stop loaded coolies when going satisfactorily is bad policy.

A few stones came down, but they went wide of me, and I thought that instead of making the coolies halt I could arrange to take a somewhat different route from theirs. This was difficult because of icy gulleys requiring steps, and the coolies doubled back until they were right above me. The rocks being steep and broken I could not see them, and the first intimation I had of their position was a stone of almost 2 in. diameter whizzing past my nose and hitting me a resounding thump on the chest. As I happened to be in a slightly awkward position, if the stone had been bigger, or if it had hit me on the head, I might have been knocked down. I shouted to them at once, and Anderkyow peered over a ledge about 60 ft. above me. It was he who had sent down the stone. On inquiry, at the top, as far as I could make out, the coolies had thought that the injunction was for them to keep together, but that the Sahib could do as he pleased. The blame was mine for not stopping them earlier. Elementary mountaineering rules cannot be disregarded with impunity.

It must be pointed out that what we saw from Long Ridge Pass conclusively proves that the Pandit Chandra Das must have crossed the Jonsong La, so that Chatang La as given by him is perhaps another name for this pass. Professor Garwood's adverse criticism of the pandit's description of the route is probably due to his having passed over the ground in the reverse direction under different conditions. The pandit's description of his route from Ramthang northwards is correct except as regards compass directions. The portion of the path mentioned as being among boulders is about 2 m. N. of Pangperma, and the seracs referred to are those at the confluence of the S. Langpo and Jonsong Glaciers.

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



A. M. Kellas, photo

Swan Electric Engraving Co., Ltd.

VIEW OF PAWHUNRI (23,180 ft.), FROM THE
TEESTA GLACIER (17,000 ft.).

Proceeding to Giagong and the Tso Lhamo (lake of the goddess), we reached the snow level at 18,000 ft. on the third day. Here one of the yaks—aided and abetted by its owner—refused like a sensible animal to come further, so that we had perforce to camp early. On the following day an ascent of 20,700 ft. was made, but we were driven back by a high wind which whirled the fine surface snow into dense clouds. The camp was next moved up to 20,000 ft., and on the following day we reached the summit 23,180 ft. The view was unfortunately spoiled by clouds beneath us, but was nevertheless interesting. W. and S. nearly everything was obscured by a rolling sea of mist, above which some of the great peaks, Kangchenjunga, Chumiomo and the Kangchenjhaul, showed their crests like rocky islands. About 4 m. to the E. was an accessible snow peak about 23,000 ft. high, and between us and it there flowed northwards a fine glacier and not a river as marked on the map. On the way up we had glimpses of the N. end of the Chomolhari Range, but the most interesting view of all was two lofty snow peaks bearing E.N.E., about 100 m. off, which towered up above the horizon in a most imposing manner. Only snow was visible and must have represented about 6000 ft., which would make the mountains at least about 25,000 ft. high. They seemed to be distinctly N. of the main chain; mist covered them before we reached the top. We took nearly 6 hrs. to ascend but did not hurry. Keeping close to the edge of the western cliffs until about 1000 ft. from the top, we then made a bee line for the summit through snow nearly a foot deep.

The summit was corniced to the E., and was some distance from and much higher than the tops of the western cliffs. We remained on the top about 35 mins. We felt quite comfortable except for the cold wind, and I am confident that there would have been no difficulty in carrying out moderately complicated experiments, *e.g.* estimating the number of red and white corpuscles in the blood. This is specifically mentioned, because authorities have stated that such estimations would probably be impossible above 16,000 ft. Samples of air were taken and estimations of carbon dioxide started.

Had we brought a spade with us we might have dug a big hole on the top and brought up a tent next day to carry out some experiments and get photographs. It was quite hopeless to think of pitching a tent unless we had some protection from the wind, the tussle with which on the Langpo Saddle we were not likely to forget. The descent took us about 2½ hrs.,

but we did not descend nearly so quickly as in 1909, when we only took about 2 hrs. between 23,000 ft. and a camp at 18,500 ft.

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

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

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

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

I have only had experience of two professional guides—Swiss—in the Himalaya, and they were more adversely affected by elevation than myself.

It is not impossible that people accustomed from childhood to pressures of $\frac{3}{4}$ atmosphere or less may either require less oxygen or may have greater lung capacity. A little more will be said about this interesting subject—the effect of elevation—later.

On descending to the desolate flats called Pawhunri Waags at the base of the mountain, one is struck by the extraordinary variety of wild life which may be met with. A herd of eight kiang passed quite close to us. Several types of wild birds were met with about the Tso Lhamo, including eagles, pheasants,

and two pairs of handsome geese with black and white wings. Later on, we saw on the way to Chumiomo another half-dozen pairs of these geese, but we only saw one young one, of which the parent birds seemed very careful. It made one annoyed to think that a certain type of gunner—one does not mean sportsman—could easily have exterminated all these geese, for they were quite easily accessible.

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

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

On the way back to Thango we met Mr. Bell, the British resident from Gangtok, who was most kind and hospitable. He was much interested in the report of the existence of lofty snow peaks to the E.N.E., which he suggested were part of the Kuhla Kangri Mountains. He had seen the S. of Kuhla Kangri from Bhutan, but his account did not agree with the two peaks seen, which were probably about 12 m. apart and different in appearance. On asking Mr. Bell whether it would be possible

to investigate the peaks from Bhutan he stated that that country was quite closed to white men at present.

The weather continued so broken towards the end of June that we had to give up our intentions of attacking the Jonsong Peak and turn our attention to Kangchenjhou (22,700 ft.) and Chumiomo (22,430 ft.). On the way back from Pawhunri we had examined the N. face of the former mountain as far as mist would permit, but could see no good way leading to the summit. The mountain had never been clear, however, even in the early morning. In order to investigate the S. side we determined to ascend the Sebu La (17,600 ft.), and started on June 22. We had the pleasure of Mr. Bell's company for part of the way. The whole of Kangchenjhou was never visible at one time, but enough was seen to show that the mountain was practicable by a long icefall, which started E. of the main peak and curved round towards the S.W. It was impossible however to climb the mountain in the circumstances, because the relationships of the crevasses were complicated, and the possible route was only visible for a few minutes in the morning. It was therefore decided to cross the Sebu La and attempt Tsen-Gui-Kang, a fine peak 21,000 ft. high, which we had admired from Momay Samong in 1909.

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

It was about 2 o'clock when we reached the snow on the pass, and to my surprise the coolies were most unwilling to cross. They declared the snow far too soft, and I had to ascend alone nearly three-fourths of the entire distance to the summit before they started to follow. Having a rather hazy idea of the proper route, I went quite close to a few small crevasses which might easily cause trouble to an unroped party. I found later that these small crevasses are specially mentioned by Mr. Claude White in his book on Sikkim and Bhutan. It snowed or rained nearly the whole of the day and two nights

spent near Sebu Lake, and as the crests of Tsen-Gui-Kang and Kangchenjau remained obstinately in the mist we moved back to Thango. Here followed an awkward delay because a portion of our party had not returned. This resulted from my mistake in giving the Sirdar a certain amount of latitude, although his instructions seemed definite enough. In the circumstances Sona and Anderkyow were sent to look at the W. face of Chumiomo, which I had examined with a telescope from near the Jonsong La, and which had seemed possible. They returned three days later, and reported that they had not been able to get over the ridge to the N. of it as instructed. On inquiry I found that they had mistaken Lachen Kang, a peak 21,600 ft. high, for Chumiomo, and had been trying to cross the difficult ridge N. of that mountain. This experiment showed that I had over-estimated the intelligence of the men, to whom Chumiomo had been repeatedly pointed out when on the way to and from Pawhunri. When dealing with coolies it is necessary to be more than usually precise, and to get them to repeat what is required. The fault obviously lay with myself.

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

Crossing the Lungnak La in heavy rain we proceeded along by the Naku Chu, passing the ruins of an old Tibetan fort (Dzong) on the way. There were some fine herds of yaks in this valley. The evening of the fourth day found us encamped on the S.W. escarpment of Chumiomo under towering precipices. We found that Chumiomo was certainly possible from the S.W. but that the N.W. arête looked much easier. Mist was almost continuous, and snow fell at intervals. This incessant moisture seemed to affect the rocks, and falls were more frequent than I have ever known them. Some tremendous rock avalanches fell from the precipices of the S. face.

As our tents on the rocks were more exposed to the dangers of falling stones than is allowable for moderately orthodox

climbers, and as the weather seemed much better a couple of miles to the N., we moved our camp round to the N.W. face of the mountain. On the way, soon after crossing the Tibetan frontier we saw a large party near the head of the Naku La about half a mile off, and two men on ponies immediately started in our direction. The coolies were alarmed. 'Tibet men! Tibet men!' was the cry. There could be no question of retreat, for we had excellent reasons for being there unless we interpreted our 'pass' to Upper Sikkim in what seemed to us an absurdly academic manner. Sending the coolies on by a route which would be difficult for ponies I carefully examined the party through a telescope. The men on the ponies seemed to be Tibetans, but on scrutinising the party near the top of the pass a lady in European costume was distinguished, who could only be Mrs. Grieve, who was with Mr. Bell's party, which we thought to be 40 m. off. We met Mr. and Mrs. Grieve afterwards in Darjeeling and learned that, although quite unaccustomed to high altitudes, they had ascended to about 18,500 ft. without difficulty. Mr. Bell himself had reached about 19,000 ft. Mr. Bell's party was however particularly well equipped, so that fatigue should have been a minimum. The men on the ponies halted and we proceeded on our way. We camped near a beautiful clear stream of water flowing from a small glacier on the N.W. flank of Chumiomo at 18,500 ft. and next day moved our camp up to 19,500 ft., camping on rocks which obviously contained a large quantity of copper. Although only about 2 m. in a direct line from our old camp at the end of the S.W. arête, and in a similar position—namely on rocks near precipices—the weather was quite different. Rock-falls were very rare and the mist never came down to our level.

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

On July 12 we started at 6.30 A.M. The morning was doubtful. Ascending to near the head of the glacier, we crossed, and went up to the right of some séracs which nearly touch the N.W. rock arête. At a height of a little over 20,000 ft., near the base of the final ascent were a few awkward crevasses, but after passing these the mountain was surprisingly easy. Tuny and Sona wished to try the N.W. rock arête, but I insisted on trying the snow which although steep was in



A. M. Kellas, photo.

Swan Electric Engraving Co., Ltd.

NEAR THE SUMMIT OF CHOMIUMO (22,430 ft.).

excellent order, and probably took not more than a third of the time that the rocks would have taken. I mention this because the coolies always balked from steep snow, being under the impression that it was dangerous. We arrived on the summit arête in mist, and had to wait for some time before the N. top loomed up about 200 yards off. Ascending to this top, which is only a couple of yards broad and appears as a sharp snow peak, we halted until the mist lifted somewhat, and then proceeded along the arête to the S. summit, which is about 300 ft. higher. It was a beautiful walk without the slightest difficulty, although in places the way was narrow and we were quite close to the edge of the formidable Eastern precipices. The snow was never more than a foot deep. The S. top is bounded on the S. and E. by precipices, but is several yards broad and quite safe. We remained for about half an hour on the summit (22,490 ft.) and then proceeded back by the way we had come. Mist had interfered greatly with our views from the top, but fortunately we managed to get some photographs, and we took others while proceeding along the arête. We were back in camp about 4 o'clock after a day which impressed us all by its easiness. On the return journey the snow on the steep slopes was in good condition, but near the crevasses at the bottom was so soft that we sank repeatedly nearly to the waist.

Sona and Tuny did not seem to be much affected by the elevation, while I felt that I could have climbed considerably higher. Whether this was due to a rest the day before, or to my becoming acclimatised to high altitudes is somewhat difficult to decide. Probably both factors contributed, especially the latter. One of the main difficulties at high altitudes depends on the fact that one does not breathe rapidly enough to oxygenate one's blood sufficiently, and it is only after some weeks that one seems to be able to accustom oneself to breathing faster, which makes a great difference to one's comfort in climbing. Next day we proceeded to Thango, a fairly long day's march. We crossed the N. Chumiomo Glacier, and ascending the ridge to the E., descended to the pony track which proceeds N. from Lachen to Kamba Dzong. From the summit of the ridge (about 20,000 ft.) a magnificent view was obtained of the mountains stretching away to the W. What we had suspected before became clearly evident, namely that on the E. side of the Arun River there are several lofty peaks, which would almost certainly hide the Mt. Everest group from any traveller on the mountains of N. Sikkim, unless from view-points over

21,000 ft. The highest of the range, which is called Kanglingen, appears as a massive snow peak, and must be over 23,000 ft. high. Near it a route leads from Saar over an easy pass called the Tok Tok La to the Arun River. We are therefore nearly sure that Mr. Claude White and others are in error when they stated that they had good views of the Mt. Everest group from positions on or near the mountains of N. Sikkim. It is probable that on very clear days the loftier peaks may show over the Kanglingen group, but they could hardly be very conspicuous. Observers may have confused the two groups.

As we would have had to wait at Thango for at least a fortnight before the weather was good enough to guarantee a satisfactory view from the summit of the Jonsong Peak, we decided to go round to the other side of Nepal and make an attempt upon Kāmet. This was not a judicious decision, as our time was too limited. Darjeeling was reached on July 25, and here we bade farewell to the faithful coolies who had accompanied us for about three months. In order to prevent misunderstanding one must state that all of these men were in the best of health and spirits. They were thoroughly satisfied with food and pay and the amount of work expected of them, and when asked at Thango whether they would remain for another month if we decided to attempt the Jonsong Peak and the Kangchenjau, every one of them volunteered to stay without hesitation. These Sherpa Nepalese coolies are in fact most agreeable to work with, and if treated kindly will do anything reasonable.

Taking Tuny and Sona with us we left Darjeeling on July 27, and three days afterwards arrived at the railway terminus of Katgodam, where our route joins that taken by Messrs. Mumm, Longstaff and Bruce in 1905. Anyone wishing to get a good idea of Kumaon and Garhwal cannot do better than read Mr. Mumm's book. On the third day from Katgodam we reached Almora, the capital of Kumaon. The Deputy Commissioner was absent, but the Assistant Deputy Commissioner was most obliging and gave me a note to the Tahsildhar, who threw himself into the business of getting coolies with a most praiseworthy energy. Within half an hour two sets of seven coolies each were paraded for inspection. I wished to select a few from each batch, but was informed that no one of the first batch shown would travel with any of the second because of caste prejudice. The men selected were quite different in physique from the Sherpa Nepalese coolies, being tall and slim, and their stamina was found to be inferior. They would only

carry about two-thirds of the loads taken by the Sherpas, but they agreed to come through the Badrinath, about ten days' journey by the Kuari La. This was the first time that any arrangement of the kind had been entered into, and it worked well. The coolies required more encouragement than Nepalese coolies, and being Hindoos preferred to be paid cash for food. Any white man or Buddhist like Sona and Tuny touching their food would spoil it. I therefore left them entirely to themselves when at meals. The unconscionable time they took to breakfast—about three hours—during the first few days caused me to make inquiries. I found that they had only one small griddle pan between the seven of them, and that each of them used it for cooking ten to twelve chupatties in rotation.

The three days' march from Almora to Gwaldam was easy but very hot. Sona and Tuny although very lightly loaded had complained of the heat since leaving Darjeeling, and I was disappointed to note that they were not nearly so happy as in Sikkim.

At Gwaldam we entered what seemed to be a region of continual rain. For the next six days we pushed on through torrents of rain and dank and dripping forests to Joshimath. We generally camped on the path and trenched our tents thoroughly. At Joshimath we met with a surprise and disappointment. At Almora the Acting Deputy Commissioner told us that he had no jurisdiction over Garhwal, the Deputy Commissioner of which resided at Pauri, about 100 m. off, and advised us to write and ask permission to proceed to Badrinath. We had done so, and from our experiences in Sikkim never doubted that it would be granted. At Joshimath the *patwari*, or local magistrate, called with a letter from Mr. Stowell prohibiting further advance, and threatening legal action if we proceeded. After telegraphing twice and losing a day we were allowed to advance.

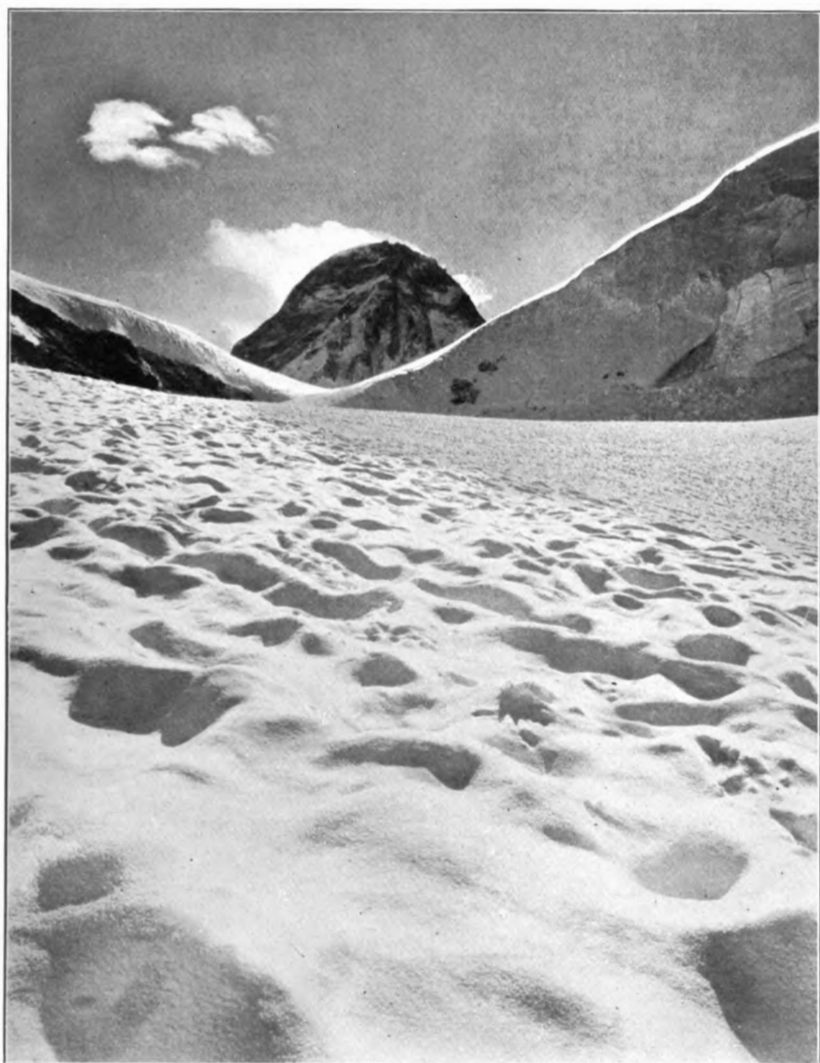
At Badrinath we visited the temple and were kindly received by the Rawal Sahib, the Chief Worshipper, and his assistant, the Pandit Bidya Datt.

Taking in all fifteen coolies, we proceeded northwards, and the second afternoon found us encamped at the end of Khaiam Valley. The coolies here quite misled me, insisting that this valley afforded the best way to Kāmet, whereas we should have taken the Khāti (or Gastoli) Valley to the S. We found these Mana coolies most unreliable as regards information, and would never again trust them. On ascending to Khaiam Pass (19,800 ft.), the tops of the mountains being in mist, Mana

Peak was pointed out as Kāmet. This is difficult to understand, seeing that the men had been on Kāmet not long before, but I have noticed that the geographical sense of many coolies is remarkably vague. We next pushed up a camp to 18,500 ft., and ascending the pass early in the morning were fortunate enough to get a magnificent view of Kāmet and attendant peaks.

The mountain looked impossible from the W., but it might be practicable to ascend a steep slope of snow to the S. of the peak, and bend round on to the N.E. face, which looks the most probable direction for a successful ascent. We climbed a small snow peak about 20,200 ft. high to the N. of the pass, but the mists had covered Kāmet before we got to the top, and little further was learned. In addition to the peak marked as 24,170 ft. in Dr. Longstaff's map, there is a fine rock peak of about the same height to the N.W.

The total result was disappointing. The E. face of the pass was crevassed, and although routes could have been forced in two places given sufficient time, we decided to try further to the N. in order to see whether the N.W. face of Kāmet was accessible. Sending off the Almora men homewards under Tuny, we proceeded N. towards Mana Pass, camping at the end of the Dhanarau Glacier, which has two main branches. During the whole of the next day we were toiling up by the side of the N.E. branch, which we followed nearly to its head, camping at about 17,000 ft. On the following day, sending Sona and two other coolies to Dhanarau on the Alaknanda, Alum Singh and I climbed Dhanarau Peak, a long easy mountain about 19,000 ft. high, lying to the N. of the glacier. From the summit we had a fine view of the N.W. face of Kāmet. This face looks practicable if one could get on to it. The arrangement of the gorges to the N.W. of Kāmet is probably incorrectly given on the map and would repay investigation. If we had only had another fortnight! It was however imperative that we started for Bombay. Our Almora men were already three days' march ahead of us. We therefore decided to go on to Mana that night, and the coolies ably seconded our efforts. It was however quite dark when we passed through the Mana gorge, which was filled with mist. The coolies knew every step of the way however, and one man followed another closely, slowly and with great care. It was between 9 and 10 P.M. when we reached Mana. Next day we went on to Joshimath, a long 22 miles. We halted for about 3 hrs. at Badrinath, so that we had the interesting experience



A. M. Kellas photo.

Swan Electric Engraving Co., Ltd.

SUNRISE ON KĀMET (25,400 ft.), FROM NEAR THE SUMMIT OF
KHAIAM PASS (19,300 ft.).

of going along the slightly dangerous path above the Alaknanda in darkness, it being nearly midnight before we reached the bungalow. The Mana coolies preferred to stop soon after it grew dark, and I told Sona he could stop if he liked and join me early next morning. He preferred to come on, but waived doing his share of the leading. In many places a false step would have precipitated us into the foaming Alaknanda 500 ft. below. We went slowly, but even then both of us were drenched with perspiration because of the almost incredible heat radiated from the rocks of that wonderful valley. There was only one really troublesome place, just after crossing the junction of the Dhauli and Alaknanda at Vishnu-prayag, the path having been washed away. I thought that we would have to halt there for the night, but after several fruitless attempts we got across. Next morning, the coolies having joined us, and all feeling quite fresh, we went on to near the top of the Kuari La. From there to Gwaldam we had even more rain than on the upward march.

One incident is worth noting for the sake of future travellers. On the night we stopped at Rhamni, Sona omitted to trench my tent, and I awoke about 2 A.M. with one shoulder in a pool of water. My bedding and clothes were nearly saturated, and my maps and books which formed part of my pillow sopping wet and spoiled. It was what is sometimes referred to as a 'wash out.'

At Rhamni I came across a mission outpost, and the native missionary told me among other interesting information that the Christian converts were required to give up smoking, and that the Government prohibited the manufacture of intoxicating beverages. Although I happen to have an antipathy to tobacco, I must say that the first regulation seems unduly hard upon the poor Indians, especially as the smoking in this part of India is not in the slightest degree objectionable to others, and the cost trifling. My seven Almora coolies, who used the solitary griddle pan, had one hubble-bubble pipe between them, which was passed from one to the other during halts. The simple life could hardly be carried further. The tobacco used is admixed with sugar, so that after the smoke has been washed with water the odour is faint and not disagreeable.

Two double marches had to be negotiated between Rhamni and Almora,—a rather difficult proceeding—but by the friendly aid of the old *patwari* of Ghat, whom I will always gratefully remember, and the kindness of Messrs. Nash of Gwaldam we managed to get through.

Pushing on ahead of the coolies, I arrived in Almora on the same day as Tuny and his men. Next forenoon Sona came in with the others, and with fresh men we started at once for Katgodam, the railway terminus, which we reached in good time.

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

The other factors, which, when aided by elevation, tend to upset one's capacity for keeping all the organs in the proper co-ordination which we call health, might be summarised as follows :

1. Inadequate training.
2. Indigestion due to unsuitable food.
3. Over-strenuous exertion.
4. Want of acclimatisation to high altitudes.
5. Exhaustion.
6. Psychic effects.
7. High temperature.
8. Chill.
9. Snow glare.
10. Advancing age.

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

2. *Indigestion due to Unsuitable Food.*—The best possible diets for high altitudes have yet to be devised. There is probably no doubt that the appetite is lessened. After long and careful experiment, we found that the best mainstay of both morning and evening meals was a large bowl of soup, thickened with rice and with added butter. The three ingredients were served separately. One could then add tongue, boneless sardines, &c.

as wanted, but it was found that the entire elimination of meat by substitution of four or five freshly made chupatties—unleavened pancakes—with jam and butter, was occasionally a good plan. Of course different men require different diets.

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

Perhaps peptonised foods and prepared glycerophosphates like sanatogen might be useful for protracted camps at heights over 28,000 ft. Hot tea in Thermos flasks we found excellent at high altitudes, but the two flasks taken were broken within a month. Failing tea Professor Collie informs me that citrate of caffeine is an excellent substitute.

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

4. *Want of Acclimatisation to High Altitudes.*—In attacking very lofty peaks it would probably be found advisable above 20,000 ft. to push camps up only from 1000 to 3000 ft. per day, according to the difficulties met with. The idea that the bad effects of high altitude are cumulative is, we think, completely negatived by the ease with which, at the end of the expedition, we climbed Dhanarau Peak (19,000 ft.), marched about 20 m., and then made 22 m. next day.

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

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

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

10. *Advancing Age* is like elevation itself a general depressant of one's powers, but if we consider that one of the veterans of the Club when getting towards three score led a large party over a pass more than 20,000 ft. high into an unknown country,

the effect of age is obviously variable and must be greatly discounted in certain cases.

It must not be supposed that the natives are never afflicted with what looks like mountain sickness. I have met with several cases but usually at comparatively low levels.

When camped near Pangperma, two natives of Kangbachen, an old man and his son, started to cross the Jonsong La, but at about 19,000 ft. the father, a man of about fifty, was seized with a violent headache, and they went back to Kangbachen. The headache passed off to some extent after having tea at our camp.

Mr. Claude White mentions in his book on Sikkim and Bhutan that many of his Nepalese were affected by sickness at 14,000 to 15,000 ft.

Alum Singh, the leader of the men from Mana, who came with me from Badrinath, informed me that he and other coolies when with Lieutenant Slingsby, earlier in the year, had been badly affected by mountain sickness.

Perhaps three facts might be emphasised in conclusion.

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

2. Men with cloth boots should not be taken on dangerous ice slopes, and especially ice traverses. This follows from what has been related above, and is confirmed by the experience of Professor Collie in Kashmir. Many members of the Club will doubtless consider such a statement superfluous, but when in the Himalaya one is frequently strongly tempted to use the material at hand.

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

I have to offer my sincere thanks to Professor Collie for very kind advice and assistance.

MAP OF NORTHERN SIKKIM
 with adjacent portions of
TIBET AND NEPAL
 to illustrate a paper on "The Mountains of Northern Sikkim" by
 A. M. KELLAS.



Authors route ——— G - Gumpa or Monastery. La - Pass. D = Dok or Cattle Station.