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The
GEOGRAPHICAL JOURNAL

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MASHERBRUM, 1938

T. GRAHAM BROWN

Evening Meeting of the Society, 20 February 1939

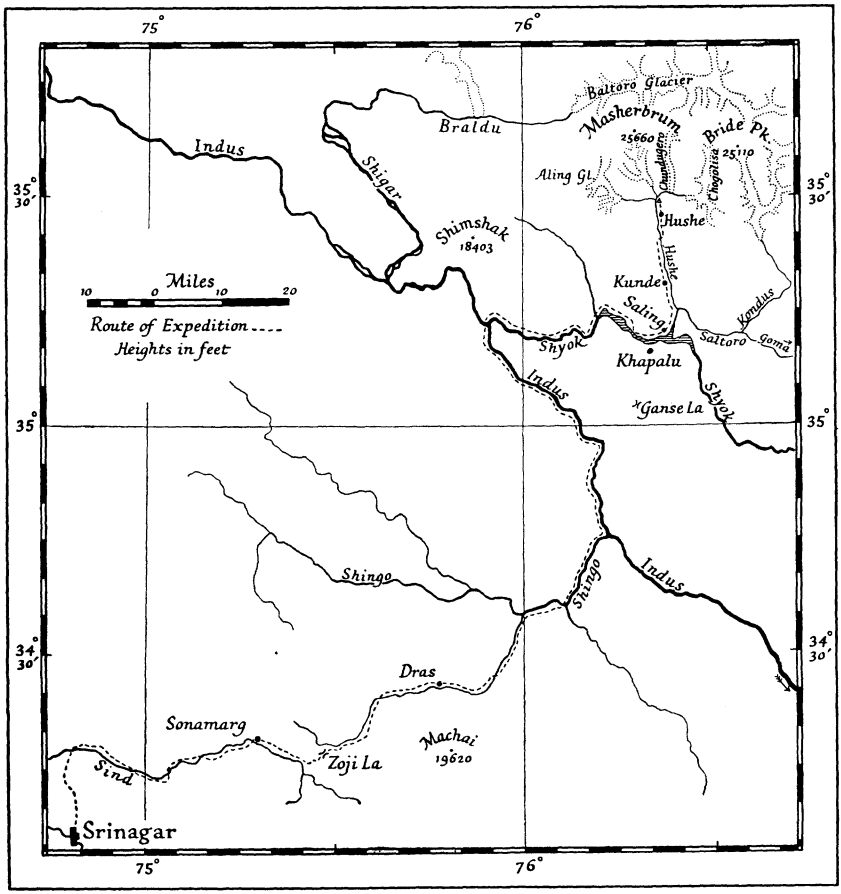
THE left bank of the great Baltoro glacier in the Eastern Karakoram is bounded by a high mountain chain which runs east and west and forms the northern edge of an irregular quadrilateral of lesser ranges and peaks. From this backbone, and at about the centre of the main trunk of the Baltoro glacier, rises Masherbrum (25,600 feet), whilst the eastern end of the chain carries Chogolisa[1] (25,110 feet) near the confluence of the Baltoro tributary glaciers and at about 15 miles from Masherbrum. The quadrilateral itself consists of long subsidiary ridges which in general extend far to the south, but with many complications. Its drainage to the north is by relatively short subsidiary glaciers into the trunk of the Baltoro glacier, and to the south it drains by complicated glacier systems which collect into long valleys and discharge nearly due south into the Kondus and Shyok rivers; the unexplored north-west segment of the mass seems to drain in that direction by at least one long glacier, the stream from which joins that of the Baltoro.

Save for a tentative exploration from the Baltoro side by Bruce and Conway in 1892, the forbidding northern precipices of Masherbrum have been left alone, but several travellers have explored its southern glaciers. From the mountain a lower ridge runs nearly due south for about 10 miles and separates the Masherbrum glacier on the west from the Chundugero glacier on the east, the combined streams from the latter and from the Chogolisa glacier still farther to the east running under the termination of the ridge to join those from the Masherbrum glacier and from the Aling glacier farther to the west. The combined streams then flow due south past Hushe village and down the Hushe valley, to discharge into the Shyok river at a point about 32 miles south of Masherbrum. All four of these glaciers have been previously visited.

The first traveller to reach these glaciers seems to have been Godwin-

[1] The Karakoram Conference Report recommends Chogolisa in preference to Bride Peak (*Geogr. J.* 91 (1938) 150).

Austen,[1] who penetrated the Masherbrum and Chundugero glaciers in 1860 for about half their lengths, but published little description of them. On the authority of Dr. Hunter Workman, Mr. Sillem, a Dutchman, ascended the Masherbrum glacier in 1903, when he thought that he saw a way thence over the main ridge, but was prevented from attempting it. He apparently published no account of his exploration before his untimely death in the Alps two



The route to Masherbrum

years later. Dr. Workman himself,[2] accompanied by his wife, explored all four glaciers in 1911, probably ascending the Masherbrum glacier for about half its length and certainly penetrating the eastern head of the Chundugero glacier. Since 1911 the glaciers have been left in peace save by the hillmen who graze their cattle during the summer months in the lateral troughs of the glaciers and on the lower bounding slopes above them, and by occasional

[1] *Journal R.G.S.* 37 (1864) 20.
[2] 'Two summers in the ice wilds of Eastern Karakoram.' London, 1917.

sportsmen, to whom the Hushe valley and its side glens are notable hunting grounds. No serious mountaineering party however had visited the district before 1938.

It was with the intention of exploring Masherbrum from the south, and, if possible, of climbing the mountain, that a small and informal party left Srinagar at the end of April 1938. Captain J. Harrison, Mr. R. A. Hodgkin, Lieutenant J. Waller, and the writer set out on April 28, whilst Lieutenant J. O. M. Roberts followed us by forced marches a few days later. With us were five Sherpa porters of good experience, and Roberts brought with him two less experienced Gurkhas from his battalion. Our route took the usual way across the Zoji La, snow lying more or less continuously from below the Sonamarg gorge to beyond Dras, four marches later. The winter of these 40 miles or so of snow was dramatically succeeded by spring and apricot blossoms as we descended the Shingo river, and we had almost entered a climate of early summer in the Indus valley when we had to leave it to strike east up the Shyok. Two forced marches then landed us at Saling, a little above Khapalu, on May 13. Here, near the confluence of the Hushe river with the Shyok, we paused for a day, and Harrison left us for a time in order to go up the Saltoro valley to collect some hillmen from Goma as porters. The rest of us then turned up the Hushe valley.

This valley is about 15 miles in length from its mouth to Hushe village, and it runs almost due north and south without bend. About 3 miles above the village, the valley is prolonged to the north by the glen of the Masherbrum glacier but at a slight angle, whilst another branch of the valley turns to the east towards the snouts of the Chundugero and Chogolisa glaciers. At its southern end, the east side of the valley is formed by the fine and broken mass of the Saltoro peaks. Higher up the valley soon constricts, and its flanks are too precipitous to allow their culminating summits to be seen, but side glens give fascinating glimpses of fantastic granite mountains. These glens have washed down great masses of moraine matter into the main valley, and through these the river has cut deep gorges. As you ascend it, the walls of the valley close in, becoming ever steeper and eventually consisting of bare precipices on the east side. Above Hushe village, these precipices are set at a very sheer angle, yet their great and seemingly unfissured faces are nevertheless adorned by dwarf trees in the incredible manner noticed by Dr. Workman. In places, and particularly at the mouth of the Aling glen, there are curious formations of water-sculptured clay, and in the main valley the extremely rough track, which in places is exposed to the danger of stone fall, affords fine views of the glacier stream flowing in the canyons which it has forced through the old glacial deposits. We ascended this valley in two marches, reached Hushe village on May 16, and pitched our first base camp about 2 miles above it on a pleasant flat by the east bank of the river.

The approaches to Masherbrum had now to be explored. The Masherbrum and Chundugero glaciers obviously offered access to the south-west and south-east flanks of the mountain respectively, whilst the Aling glacier, although not so mapped, might nevertheless give a way to its west face. With regard to such possibilities, the only information which we had was obtained from a photograph of the south-west aspect of Masherbrum taken by the

Workmans,[1] which seemed to show that a climbing route might possibly be made on that side from the Masherbrum glacier. One of the finest features of the Hushe valley had been the sight of Masherbrum rising at its head, and a particularly fine view of the mountain had been obtained in the early morning from Kunde at a distance of a little more than 23 miles. This had shown the twin summits nearly in line and separated from a lower eastern summit by a high *névé* basin. From the main summits, a ridge had descended towards us, and their east and west ridges had been seen in profile, the former bounding a very steep east face which fell into the high basin. We had now a magnificent view of the mountain from our tent doors at the base camp, framed between the great rock pillars which stand on either side of the mouth of the Masherbrum glen, but the eastern parts of the mass were hidden.

The west ridge was obviously impracticable as a route to the summit by reason of the unbroken character and steepness of its rock, although doubtless it was climbable in a technical sense. The east ridge, which falls to a col at about 23,500 feet between the main summits and the lower one to the east, appeared also to be impracticable for the same reason. We had not yet obtained a facing view of the east face, but the steepness of its snow had shown that it would probably be dangerous save perhaps in long continued good weather. The south ridge apparently offered the safest route to the summit, could it be attained, but it ended abruptly in a great rock tower. The ridge might perhaps be reached above the tower by the ascent of its flank from the high *névé* basin, the way to which had therefore to be explored. It seemed to be possible that a practicable route to the upper basin might lead up either from the Masherbrum or from the Chundugero glacier (it actually discharges into both), or perhaps even through the col at its head.

We accordingly decided in the first instance to explore the Masherbrum glacier during Harrison's absence, and set out to do so on May 18, pitching camp that day at 13,300 feet in the right lateral trough of the glacier, a few hundred yards short of some primitive summer huts, the roofs of which just showed in the snow. On the following day we all ascended the glacier to a point not far distant from our camp, where a subsidiary glacier entered from the west. Here Waller and I decided to ascend the main glacier to its head in order to examine a side glacier which offered a possible access to Masherbrum and to see the south arête from the side, whilst Hodgkin and Roberts went off up the flank on our left to obtain a good view of the mountain from the south-west.

The Workmans camped in 1911 at a place which must have been near the site of our own camp. Thence, after an intermediate camp from which they obtained the photograph of the south-west face of Masherbrum referred to above, they ascended a point above the flank of the glacier which they named "Quartzite Peak" (16,839 feet). This they mapped as lying on the bounding ridge above the head of the glacier and a little north of due west from the summit of Masherbrum, although a glimpse of the latter in their summit photograph shows that their own peak was on nearly the same bearing as their higher camp, and really lay more south than south-west from Masherbrum, as seems also to be indicated by the context. In other words, Quartzite

[1] *Op. cit.* Illustration facing p. 80.

Peak is a subsidiary point on a subsidiary ridge which falls from a beautiful snow peak on the west side of the glacier, and it crowns the flank immediately above our and their camp, as was now clearly evident. Hodgkin and Roberts had this point as their objective, but in the month of May that flank is laden with deep and soft snow over what, later in the year, is steep vegetation. Under such conditions the complete ascent was impossible, but they obtained a fine view of Masherbrum almost identical with that reproduced in the Workmans' book.

Views from that angle however do not tell us much about the side glacier of access, which is well seen during the farther ascent of the main glacier. As we went up, we had fine views of the beautiful snow peak on our left, the fluted and very steep pyramid of which rises to about 21,000 feet. This peak was wonderfully displayed from the lower camps on Masherbrum during our actual climb, and we called it the "White Sail" amongst ourselves—a happy invention of Roberts's. The deep and treacherous soft snow on the glacier made our way difficult in places, but soon we came level with the side glacier of possible access, and examined it and its northern bounding ridge, the latter obviously offering no practical route. From the upper basin of Masherbrum, an ice-fall discharges on to a high and large plateau, part of which (the "Dome") crowns the upper portion of the north bounding ridge of the side glacier and discharges in its turn into the high terminal basin of that glacier. From this, the side glacier descends abruptly in broken steps, but it was now clear that a route of ascent could possibly be made up the south (true left) edge of the glacier, and on the lower slopes of that bounding flank, although the way might be exposed to avalanche danger under bad conditions.

Continuing our way, we reached the head of the main glacier, there to have a magnificent view of the semicircle of cliffs which encloses it. Our elevation here was about 14,300 feet. The rim above us stretched nearly horizontally round from the base of the upper cone of Masherbrum at a mean elevation of about 21,000 feet. The flank between rim and glacier fell through its 6000 feet or more almost vertically as it seemed, and actually at an angle which must have exceeded 35° and in some segments was much steeper. It was composed of steep and shallow rock ribs, now laden with snow, between which were suspended innumerable hanging glaciers. On the west side of the semicircle a remarkable rock tower rose from the actual rim, and on the east side was Masherbrum. We could now see the south ridge from the side. It was long, and it rose in steps. And not only did the steps appear practicable, but it looked as if there might be camp sites at one or two more level places. From the great rock tower which terminates this ridge at a high elevation (or rather, from the south ridge just north of it), a subsidiary ridge runs down to the west for a comparatively short distance, when it terminates abruptly. South of this lies the high snow plateau which rises to the Dome at its own south edge, and falls between rock and Dome to a wide and shallow trough. This, we could now see, breaks away into ice-cliffs by which, at the level of the rim, it discharges steeply down on to the Masherbrum glacier. Having enjoyed this fine view for a time, and having discovered all that was to be seen from the glacier itself, we then returned to our camp.

The Aling glacier was still a closed book, although even should it provide a

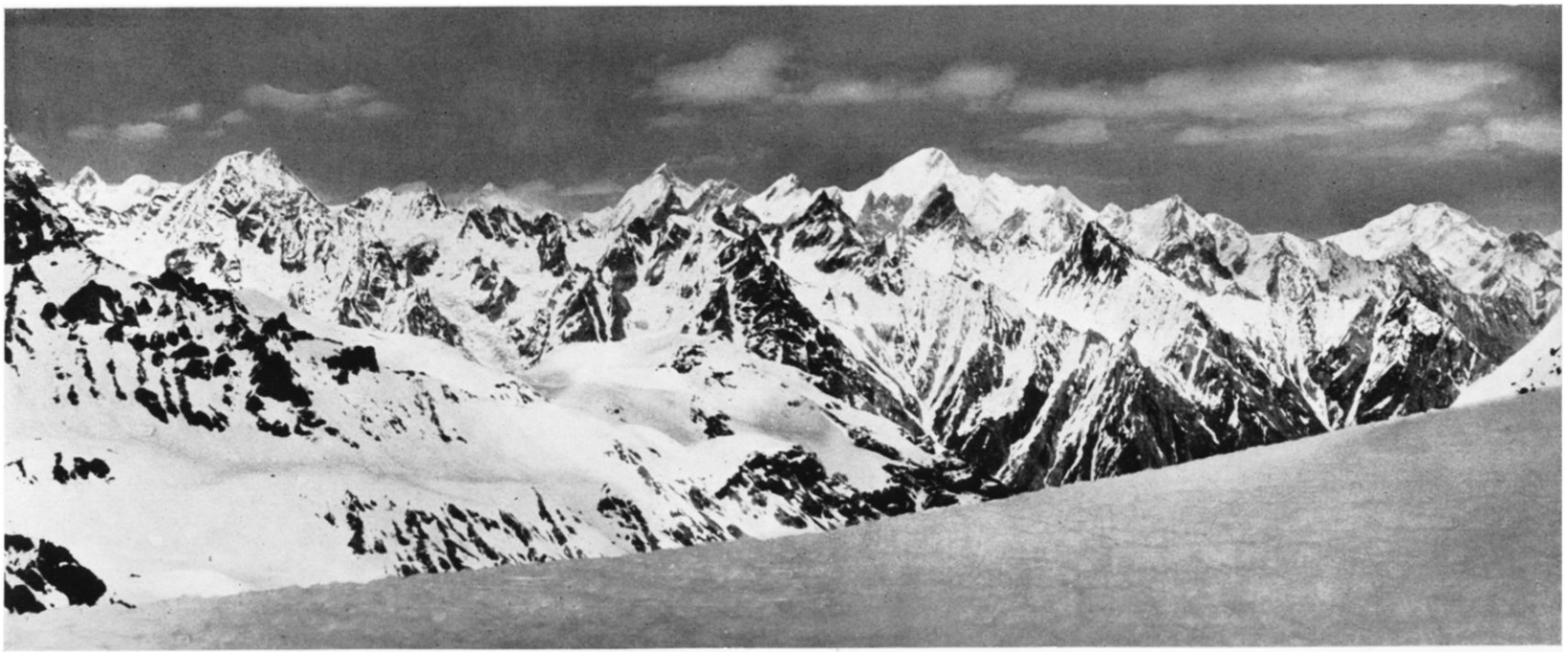
way to the rim at the head of the Masherbrum glacier and thence to the west face or ridge of the mountain (it does not do so), neither face nor ridge would be a practicable route to the summit. Closed books however excite the curious, and just below our glacier camp there entered from the west a wide side glen, up which we had seen a practicable col which would lead over towards the Aling glacier. Waller wished to return to the base camp, but we thought that we still had a day or two before Harrison should rejoin us, and, having brought up sufficient food for these days, this col seemed to offer a more interesting adventure to the rest of the party than would our original intention of exploring the Aling glacier from its mouth.

On May 20, Waller therefore returned to the base camp whilst Hodgkin, Roberts, and myself ascended the side glen with three Sherpas. The glacier was easy, as also was the flank of the col, save for its steepness and the soft state of the snow. There, probably at about 16,000 feet, we arrived to have a fine and wide view. In the north-east Chogolisa was prominent, and to the left of it high distant mountains, probably Broad Peak and Gasherbrum, could be seen. There was a great tangle of nearer ridges, those above, between, and beyond the Chundugero and Chogolisa glaciers, and farthest to our right we could see a very distant peak which at the time we thought might be K3[6], although this I now doubt. Our view to the south was more picturesque and more restricted. No very high summits were visible, but we could see peaks of fine shapes across where must lie the Aling glacier.

To attain this we left the col and descended an easy glacier, some ice-steps having to be cut when we came to its snout. Below that the glen closed in on us until its floor became a narrow ribbon of snow between nearly vertical cliffs and barely 20 feet wide. Then the stream under the snow plunged down in a high waterfall, at the side of which there was no possible way of descent, and it was clear that we must bivouac for the night if a place could be found. Going back up the gully we were exceedingly fortunate to find such a place high on its left flank where a narrow neck joined a high rock to the hillside. Having reached this, the Sherpas started building operations whilst Hodgkin and Roberts tried to explore a way down on the far side of the rock and I went up the flank behind it to see if a traverse might be made with subsequent descent to the Aling glacier. Both ways of descent proved to be impossible, but I had a magnificent view of the Aling glacier basin and its precipitous peaks from the shoulder above the bivouac. Two almost equal glacier trunks united beneath us, both greatly broken. The right-hand branch curved round to the north-east out of sight just above where it was joined by a large affluent from the west, which might possibly provide a route in that direction. The size of the main stream did not suggest that it arose from anywhere near the watershed of the Baltoro glacier, and its head is probably enclosed by a ridge which seems to join the White Sail (21,000 feet) to another peak of slightly greater elevation to the west of it.

We left our pleasant bivouac next morning to retrace our steps over the col and to reach our base camp above Hushe by way of the Masherbrum glacier. There we found that Harrison had been able to collect the Goma men much more quickly than had been expected and, returning during our absence, had visited the lower part of the Chundugero glacier. The upper parts of this

Masherbrum from the south



The view north-east from the col between the Masherbrum and Aling glaciers

glacier had however still to be explored for our purposes, and it was decided that, to save time, Harrison and Hodgkin should find a way up the affluent of access from the Masherbrum glacier whilst the remaining three of us went to see whether there was a better way to the upper basin from the east. Both parties were to return to the base camp in six days' time.

Roberts, Waller, and myself therefore set out on May 22 to explore the Chundugero glacier. A rough track runs along the left bank of the Hushe river nearly due east from the base camp to a point level with the snout of the glacier. Here the south enclosing flank continues in the same easterly direction to become that of the Chogolisa glacier, whilst the Chundugero glacier nearly impinges against it at right-angles, its terminal moraines being separated from the cliff merely by the width of the glacier stream. Turning north up the eastern edge of the moraines we soon reached a definite left lateral moraine from which we had a good view up the Chogolisa glacier, the snout of which was not far distant. The high peaks at the head of the glacier were unfortunately in cloud. Continuing up our moraine, we finally pitched camp that day at 12,475 feet.

Masherbrum also had been in cloud all that day, but we obtained a fine and clear view of it next morning. The right-hand (north or north-east) skyline of the terminal mass fell almost vertically and suggested an equal steepness of its north face. Going on up the left moraines and flanks of the glacier we finally pitched our second camp at 13,800 feet, not far below a point where the axis of the glacier bends to the east or north-east round a corner. Whilst camp was being made, we continued upwards for another hour or so in order to see what we could of this origin of the glacier. Then we returned to our camp, which was beautifully set beside a lake between the lateral moraine and the flanks above, amidst surroundings as fine as any I have met.

The summit of Masherbrum was never free from cloud whilst we were here, but the greater part of its eastern flanks was visible, and it was now clear that no practicable route could lead to the upper basin from this side, unless a way could be made from the north-east through the col at its head. We could see that the upper basin discharges on both sides of the subsidiary ridge which runs south from Masherbrum. On the west some of its ice falls by way of the high plateau directly on to the Masherbrum glacier, whilst some of it reaches that glacier less directly by way of the side glacier upon which the other party was now engaged. On the east the ice from the upper basin falls over cliffs into a high collecting basin, the ice-fall from which is of great breadth, though forming only a part of one of the most amazing ice-falls which I have ever seen. Broad ice-streams from at least four great gathering basins or glaciers break into ice-falls high above the main glacier and converge, coming as it were shoulder to shoulder without trace of intervening moraines. The whole blends into an ice-fall of great steepness and height, but the latter (perhaps not far short of 3000 feet) is almost dwarfed by the great breadth of the system.

A long and broken subsidiary ridge descends to the east from the lower east peak of Masherbrum, and terminates in a fine rock peak almost the shape of the Matterhorn. As far as we could see, the most northerly component of the great ice-fall arises from a high glacier which may possibly sweep round this peak

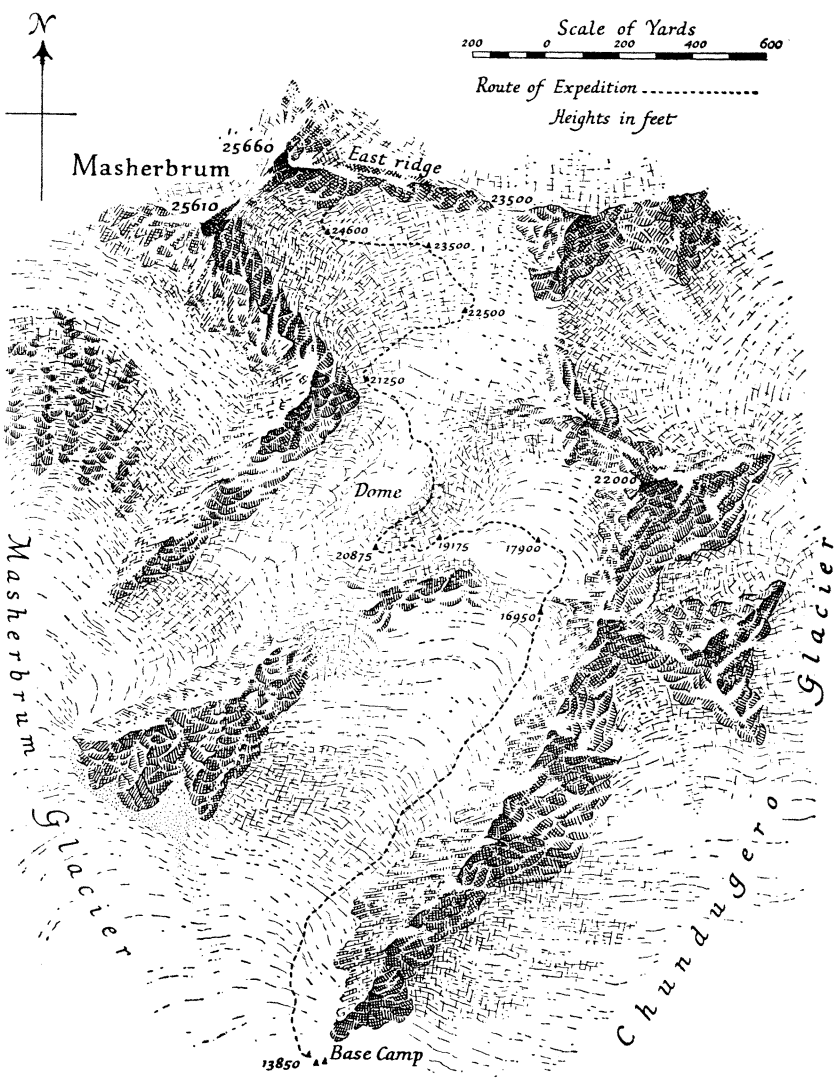
from the north-west. If so, and were it possible to ascend the ice-fall, this glacier might offer a way round to the col at the head of the upper basin. These improbabilities attracted Roberts and myself, and an alternative route to the upper basin might be useful, but as attractive as anything was the possibility that we might see the great north face of Masherbrum; and there still remained four days of our time for further exploration and return. Waller however was rightly satisfied that any attempt on Masherbrum from the east would be a forlorn hope should the other route fail, and resolved to return to the base camp, whilst Roberts and I agreed to give two days only to the problematical exploration.

Waller accordingly left on May 24 to descend to the base camp while Roberts and I set out with two Sherpas and two days' food. Having crossed the Chundugero glacier, we ascended an intricate fault in the ice-fall between its most southerly components and the more mingled mass of the others, so reaching the foot of the rocks of one ridge of the smaller third peak of Masherbrum at an elevation of 14,750 feet. Here we had overcome perhaps one-third of the height of the ice-fall, and we now had to ascend into its more northerly parts. As below, the séracs were covered with much snow which masked the smaller crevasses, sometimes completely, and it was very difficult to find a practicable route. After one more considerable failure however we struck a successful line which carried us upwards across the middle of the fall to a partial easement, above which it again rose steeply. Going on, snow began to fall and then thickened, so that it became certain that we could not overcome the ice-fall that day, nor was there any possible bivouac place above us. We therefore descended to where some ice hummocks offered what appeared to be a safe site for a bivouac at 15,325 feet. During a transient clearing of the weather we later had a view down the Chundugero glacier to the peaks on the eastern watershed of the Hushe valley, one at least of which appeared to be of considerable height. There was a fine peak on the opposite side of the Chundugero glacier above its bend. But if any higher peaks should have been visible they were hidden in cloud.

Snow fell during the night and was still falling in the early morning of May 25, so delaying our start. As we now had food for that day only, we had neither margin of safety nor time to explore the upper glacier even were it possible to surmount the intervening ice-fall and had the weather been settled. We therefore were compelled to descend in our tracks, which were for the most part obliterated, and so regained our camp by the glacier. On the way we had a fine view up the north-east branch of the Chundugero glacier, the axis of which proved to bear 67·5° (70° magnetic). The peaks on its north bounding ridge were not impressive, and at least one considerable affluent coming in from them seemed to suggest a possible pass over to a corresponding affluent of the Baltoro glacier. The head of the glacier appears to be enclosed by a steep wall much as is that of the Masherbrum glacier, but probably of lesser vertical height, and does not seem to offer a practicable pass for a laden party, at least by inspection from a distance. The peaks of the south side of the glacier are more impressive. Many steep glaciers fall from them, and there is at least one large collecting basin on that side.

On May 26 Roberts and I descended again to the base camp, to which

Harrison and Hodgkin also returned. They had found a practicable way up the true left edge of the side glacier and had penetrated its collecting basin, an excellent and valuable piece of work. We accordingly decided to adopt that



Route up Masherbrum followed by Professor Graham Brown's party

as our route towards the upper basin. After a day at the base camp we struck it and in two marches shifted everything to a new advanced base camp at 13,850 feet on the left lateral moraine of the Masherbrum glacier and about one hour or a little more below the confluence of our side glacier of access.

Our attempt on Masherbrum commenced on May 30 and lasted a little

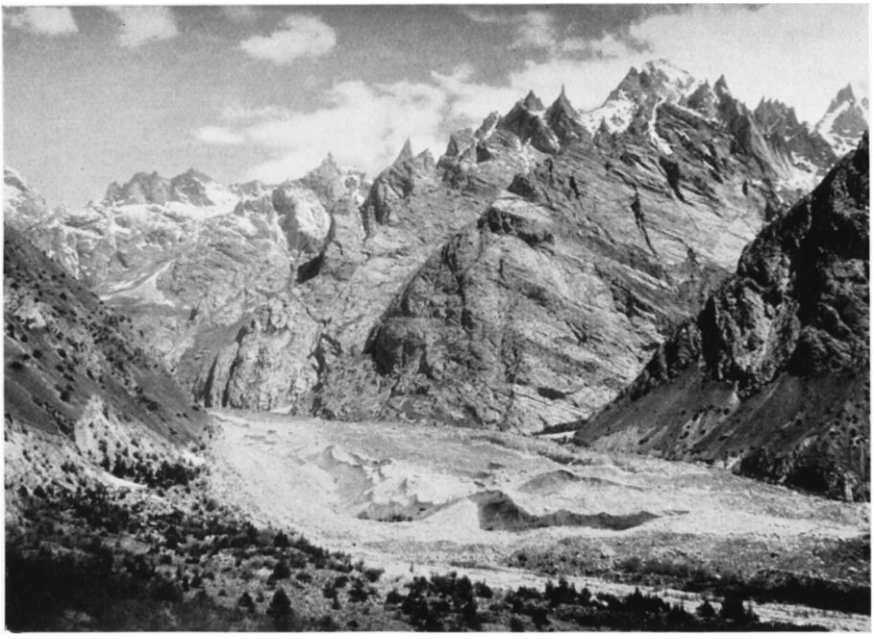
more than three weeks. During this time we had uniformly unsettled weather, snow falling at one time or another on most of the days, and movement being prevented on several occasions. Distant views were very rare. Our first camp was made at 16,950 feet, a little less than 1000 feet below the head basin of the side glacier, to which it was moved later on (17,900 feet). The north side of this basin rose in a steep snow flank to the Dome, and our second camp was set some way up the flank at 19,175 feet. Our third camp (20,875 feet) was at the top of the flank not far below the summit of the Dome. From it the broad and slightly ascending high plateau led to the foot of the ice-fall from the upper basin, and we made our fourth camp at 21,250 feet just below the left-hand end of the ice-fall near the foot of an ascending corridor between it and the base of the great tower.

On one occasion we had a partially clear view from this camp to the south and south-west. The Hushe valley lay straight as an arrow before us in the former direction, and we could see the sands of the Shyok beyond the mouth of the Hushe river, with the Ganse La beyond that again but to the right. The great mass of summits between the Hushe and Kondus valleys was only seen in part, but it seemed to be much more complicated than might appear from the map. West of K27 (which was nearly completely in cloud) there was a lower but still high peak, and north of that was a fine cone which was identifiable as one which we had seen to ascend from not far above the snout of the Chogolisa glacier on its south side.

The view to the south-west was one of great interest, but it was unfortunately more obscured by clouds. The southern watershed ridge of the Baltoro glacier ran west by south-west, carrying at least one considerable peak (apparently higher than 21,000 feet), beyond the watershed of the Masherbrum glacier. We could look over the rim of the head of the glacier on to a cloud-masked tangle of lesser ridges which descended north or north-west to the Baltoro glacier. Parallel to the Baltoro watershed on its southern side was a chain of abrupt and fantastic peaks, apparently of elevations between 20,000 feet and 21,000 feet, which culminated at the near end in a higher summit. This latter seemed to be joined to the slightly lower (and nearer) White Sail, now seen to be nearly exactly 21,000 feet in elevation, by a depressed ridge which probably separates the head of the Aling glacier from that of a long glacier which runs to the west or south-west between the Baltoro watershed and the parallel ridge. On the far side of the Aling basin was another mass of lower peaks, many of them finely moulded, and amongst these must have been the one triangulated point (21,190 feet) of this area, now unfortunately buried in cloud.

Up to this camp various combinations of us had pioneered different segments of the route, and from it three of us penetrated the upper basin on June 12. The east flank of the south ridge of the culminating mass as well as the east face of the latter had been examined from a distance during our exploration of the Chundugero glacier, but we had seen nothing of either during the climb save unsatisfactory glimpses of the face in profile. Both should of course have been visible from the upper basin, but visibility that day was limited to a few feet and no view was obtained. The following day was one of blizzard, and during it we decided that our next move would be an

Masherbrum from the Chundugero glacier, showing the highest point reached (A)



The snout of the Chundugero glacier looking north-east

The east face of Masherbrum, showing highest point reached (A) and site of Camp VII (B)

The White Sail from Masherbrum glacier

attempt by Harrison and Hodgkin with two Sherpas to reach the south arête from the upper basin whilst stores were being brought up from Camp III and a fifth camp was being established and well stocked in the upper basin itself. These two accordingly set out on June 14 and pitched their camp in the upper basin in weather too thick to see their surroundings. During a second day of snow and mist, the last of seven consecutive days of snowfall, partial or complete, they traversed the upper basin to near its north end, there pitching Camp VI at about 23,500 feet. On the following day, June 16, the remainder of the party finally established Camp V in the upper basin at about 22,500 feet, or perhaps a little higher.

That day was at last clear and sunny, so that for the first time the east face of the summit cone could be properly seen. It was a snow-face which rose in its lower part at a moderate angle from the basin but then steepened very greatly towards the top and above the level of a great ice-cliff, which ran across its right-hand or north half to above some rocks on the flank of the east arête. So brilliant did the weather appear to be, that Harrison and Hodgkin resolved to try to reach the actual summit after pitching another camp that night in the middle of the face at an elevation of 24,600 feet (by aneroid, which probably read much too high). From this they sent back the Sherpa, who reached the lower camp in an hour, and on the morning of June 17 they traversed across the face under the ice-cliff to the rocks mentioned above, by which they hoped to reach the east arête and thence the summit. The rocks however were snow-clad and proved more difficult than they had promised to be, the difficulties being increased by a very cold wind. Frost-bitten fingers and the conditions soon prevented any further attempt to surmount the rocks, and the pair returned to their camp at about midday. The weather thereafter rapidly deteriorated, and a small avalanche early on the morning of June 18 buried the tent very nearly completely. They were fortunately able to extricate themselves and their bedding, and then decided to abandon the tent and descend to Camp VI, to which Waller had gone with all the remaining Sherpas on the previous day. Visibility was extremely bad again, and Harrison and Hodgkin lost their bearings when actually not very far from Camp VI, then deciding to get into their sleeping bags in the shelter of a crevasse. Thence they shouted for help, and Waller went out with four Sherpas to try to find them. But when he had proceeded for about two or three ropes' lengths, Waller realized that there was grave risk of losing both bearings and track were he to continue, so endangering his party. He therefore turned back at about 5 p.m.

On the following morning the weather fortunately cleared sufficiently for Harrison and Hodgkin to see Camp VI, to which they descended. That camp was then immediately evacuated, all collecting at Camp V. Harrison and Hodgkin's additional exposure had resulted in frost-bitten feet in addition to the frost-bitten fingers sustained on the day of their climb, and the attempt on Masherbrum had to be abandoned. The descent to the camp on Masherbrum glacier occupied three days, and the camp above Hushe village was reached on June 23.

DISCUSSION

Before the paper the CHAIRMAN (Professor KENNETH MASON) said: This evening we have as our lecturer Professor Graham Brown, Professor of Physiology at Cardiff, whose subject is the Masherbrum Expedition. Masherbrum is one of the high mountains of the Karakoram. Professor Graham Brown was a member of that expedition. It did not, I believe, have a leader, but he was undoubtedly the most experienced member.

Professor Graham Brown then delivered the lecture printed above, and a discussion followed.

The CHAIRMAN: Will Mr. R. A. Hodgkin say a few words?

Mr. R. A. HODGKIN: I very much hope every one has enjoyed listening to Professor Graham Brown as much as I have. It has been a great pleasure to go over the ground once more. I could certainly go over it in reality many times without ever getting tired of the wonderful country in which we travelled.

Perhaps it might be of interest if I add a few words with regard to our actual experience above Camp IV towards the summit of the mountain. Harrison and I left Camp IV ahead of the others, who were following us up the mountain, stocking camps and acting in support. As Professor Graham Brown has told you, we pitched Camp V in the basin, pushed on into the doubtful weather, pitched Camp VI and awoke next morning to find, instead of the poor weather and blowing snow we had expected, a most magnificent day which offered us the chance, if not of attaining the summit, at least of getting some idea of the most suitable route up it. We pushed on up the steep snow-slopes. We were feeling quite fit and were well acclimatized. In spite of the altitude we probably felt rather more exhilarated than is usual at that height because we were getting our first clear view for many days and seeing landmarks, only too familiar by their altitude above us, sinking to our level and then below it. We pitched Camp VII on a site which seemed to us a gift from heaven: on the mountainward side of a small snow and ice pinnacle which stood well out from the face and which seemed to offer both an easily levelled patch of ground and a place that would be safe from any large avalanche from the main face. But things happened otherwise.

Next day was another fine one. After several hours' climbing in soft snow and on the east ridge our fingers became slightly frost-bitten. Having reached 25,000 feet we returned to Camp VII, and spent several hours rubbing our fingers to restore circulation. We went to sleep that night listening to a gathering storm, but little dismayed, because we had several days' food and knew we could probably stay up there if there was bad weather. At about 5 o'clock the following morning we were rudely awakened by that most disturbing of sounds in the Himalaya, the noise of an avalanche. We did not know whether it was a big one, or whether it was far away or nearby; but we were not left long in doubt. It was soon on top of us, pressing in all round, pushing in the side of the tent, so that we thought the end had come. However it had not. We burrowed our way outside and looked round, and saw that the snow which had collected on the small pinnacle which we regarded as our guardian angel had slipped down and buried our camp up to the level of the top. Apart from our inclination not to stay in a place where an avalanche had fallen, the camp was now uninhabitable. Having extricated our most essential belongings, except for one ice-axe, we started down for Camp VI in not very bad weather. However it soon became very bad and any progress became extremely difficult. For a long time we struggled down the slope, but were

eventually forced to seek shelter in a small crevasse. It was not much of a refuge because it did not keep the draught out, and having got into vocal communication of a sort with the camp below, we later decided to have another shot at getting down at all costs. We struggled on down a little farther.

All this time we were getting more and more frost-bitten. By about 6 o'clock it was getting dark and we realized that in all events we must get out of the wind before nightfall, even if we could not reach the camp we were struggling towards. We never lost our way, though we were not certain where we were; we were in fact never off the route that we ascended, but we were never absolutely certain that we were on it. As you have heard we did not get down to Camp VI. Instead we went down another hospitable crevasse where we found a small snow platform on which we spent the night, comparatively warm in our sleeping bags and out of the wind. The chief discomfort was occasional lumps of snow which would fall down and nestle in the mouths of our sleeping bags. The night passed fairly quickly. Next morning we set off again and, after going down about 100 yards, much to our relief we saw Camp VI half buried in the snow not very far down the slope. We got down safely, but I am sorry to say that as a result of our frost-bite and that of one or two other members of the party it was obvious we could not prolong the attack any longer, so final descent was the only possibility.

There seems to be little doubt that Masherbrum could be climbed, but it would be difficult under any circumstances. Captain Harrison and I both agree in thinking that the east face would probably be the quickest route to the top. Though the south ridge would be less laborious and possibly safer, it would be a roundabout approach and would involve traversing the south lower summit before the true summit could be gained. Our attempt by the east ridge seems to suggest that its angle and general difficulty would discount any advantage it might gain from its directness.

It had been a wonderful time, and even the journey back, although we were disappointed and sometimes anxious, was enjoyable in its way, travelling with such pleasant companions and in such truly wonderful scenery.

Dr. T. G. LONGSTAFF: We are honoured this evening because Professor Graham Brown is one of the most prominent members of the Alpine Club. He has made a name for himself by specializing in the ascents of the longest and most difficult ice-slopes in the Alps, particularly in new routes on the Italian side of Mont Blanc. Robin Hodgkin is also a most distinguished mountaineer. In 1937, in the course of an expedition to the Caucasus, he made a very difficult new ascent of Ushba, the double-headed Matterhorn of that magnificent range, besides several other ascents of the first order. The Masherbrum Expedition was organized by Lieutenant James Waller, R.A., now on his way back from India.

It is very hard luck that no member of the party reached the summit. As you have seen, it is difficult enough to get even to the foot of the final peak. Those great snow-slopes are much steeper than appears from the photographs. My experience is that in the Alps snow- and ice-slopes look steeper than they really are; in the Caucasus they are about as steep as they look; but in the Himalaya, almost invariably, snow- and ice-slopes turn out to be much steeper than their appearance leads the alpine climber to expect. Under the bad snow conditions it is remarkable that Captain Jack Harrison and Robin Hodgkin should have climbed to 25,000 feet. That they survived the storm which caught them, and managed to get down alive, is a great testimony to their skill and resolution. It is only men of the finest fibre who can persevere at these altitudes, when physical and mental resistance is reduced to a very low ebb by oxygen starvation.

To us, as a geographical society, the glaciers of the upper Hushe valley are topographically new ground. In the '60's Godwin-Austen visited the valley, and the Workmans have been on two glaciers. The late Mr. Sillem, a Dutchman, also visited the upper glens, but unfortunately left us no record. So Waller's party broke new ground on the exploration of these complicated glaciers, and I think that a meeting of this Society is quite the proper place to hear a mountaineering tale which includes so much true exploration. We are all very grateful to Professor Graham Brown for so excellent a lecture illustrated by such beautiful lantern slides.

Mr. ERIC SHIPTON: In the first place, I should like to thank Professor Graham Brown for the wonderful photographs he has shown us. I know something of that interesting country and like it very much indeed. I assure you that nothing short of going back there could have brought it to me as his slides have done. In particular the photographs of the Indus were really beautiful and succeeded in capturing in a remarkable way the atmosphere of the country.

The expedition itself was very different from most mountaineering expeditions that we hear of in this hall; principally in that it was an attempt to climb a mountain that had not previously been reconnoitred. The tackling of a mountain on the scale of Masherbrum or of any of the other great Himalayan giants without previous reconnaissance was a courageous effort. I knew even before this evening that the approaches to this mountain are extremely difficult. The photographs have probably now made that quite evident to every one present.

The country is extraordinarily complicated. There are countless valleys, which are minor nullahs in the Himalaya but which would be looked upon as major valleys in the Alps, that were quite unexplored. Nobody knew before the climbers went up them what lay at their heads nor whether there was a possible route. Each of these valleys had to be explored by the party before a route could be found. Thus it was remarkable that they could not only get on to the mountain and find a good way up it but that they got so high. It is pleasant to hear of an expedition which recalls the classic days when Dr. Longstaff and others were combining mountain exploration with mountain climbing. As Dr. Longstaff has pointed out, the whole of the southern side of Masherbrum is really, geographically speaking, new ground. There are no decent maps of it, and, if I may venture a criticism, I think it is a great pity that a surveyor did not accompany the expedition to make a map of the ground covered and explored. Surely this was an opportunity wasted.

From every other point of view I would like to congratulate Professor Graham Brown, Mr. Hodgkin, and other members of the party on a fine performance. I need not tell you that both of them have made ridiculously light not only of the difficulties but of the hardships they underwent.

The CHAIRMAN: I am now going to shirk one of my duties. The photographs we have seen were so magnificent that I feel I must ask Sir Francis Younghusband to propose the vote of thanks. Sir Francis Younghusband knows more about the Himalaya and their aesthetic side than any one else. He will be able to do justice to the proposition.

Sir FRANCIS YOUNGHUSBAND: I do with the very greatest pleasure propose a vote of thanks to the lecturer, for he has given us an excellent example of the kind of lecture we in this Society would like to have in the future. Most of the great exploration has been done. Rough outlines have been made. Now has come the time for parties like that which went to Masherbrum to supply the detail, and thus finish off what remains of exploration. Then, we may hope, they would come back to this Society and, in such perfect language and with

such beautiful slides as we have just heard and seen, give us an impression of what they have observed.

I have hitherto criticized photographs of the Himalaya. They have always seemed to me to reduce the magnitude and impair the tremendous impression which the great peaks make upon us as we travel amongst them. But this evening there has been an exception. The lecturer seems to have taken the most perfect photographs and exhibited them in such a way that we have got an impression of the tremendous height, the great variety, and the rugged grandeur of the Himalaya giants. That is a great thing to have done. So I do most sincerely propose a hearty vote of thanks to Professor Graham Brown, and hope we may have many more lectures like his in this hall.

The CHAIRMAN: You will not wish me to add anything further. You have expressed your thanks to the lecturer in no uncertain manner.

Note on the sketch-map of the route up Masherbrum

The party had no surveyor. The sketch-map of Masherbrum and its immediate surroundings, on p. 89, is from a drawing made by Professor Mason from photographs and constructions based upon them by Professor Graham Brown; the original sketch was modified in detail by suggestions from members of the party. There is no material for a map of greater extent to show the reconnaissances made by sections of the party east and west of the main line of approach.

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THE YUNNAN-BURMA ROAD

PATRICK FITZGERALD

Meeting of the Society, 8 January 1940

IT is generally known that one consequence of the present Sino-Japanese War has been the rapid development of the far western provinces of China, the mountainous region which to-day is the stronghold and rallying ground of Free China in the long struggle against Japanese invasion. While much of this development is unnoticed in the west, and for military reasons unadvertised by the Chinese, one achievement vital to the whole plan has caught public attention by its simple and large conception: what is called the Burma Road in China. The road from Bhamo on the Irrawaddy to Ch'ung King, China's war-time capital on the Upper Yangtze, a road built across 1000 miles of mountains to circumvent the Japanese blockade of the coast, has fired the imagination of people who have now no leisure to master the topography of the Chinese war fronts. Although some parts of the long route from Burma to the Yangtze were built before the war with Japan began, the essential link with Burma, which traverses the most difficult country, was not started until the late autumn of 1937, and was built in the short space of one year. In December 1937 no work had been done on the 280-mile stretch between Burma and Hsia Kuan, half-way to K'un Ming (Yunnanfu), the capital of Yunnan province. In December 1938 the first convoy of munition lorries passed up the road from Bhamo, and since that day the traffic has never ceased.

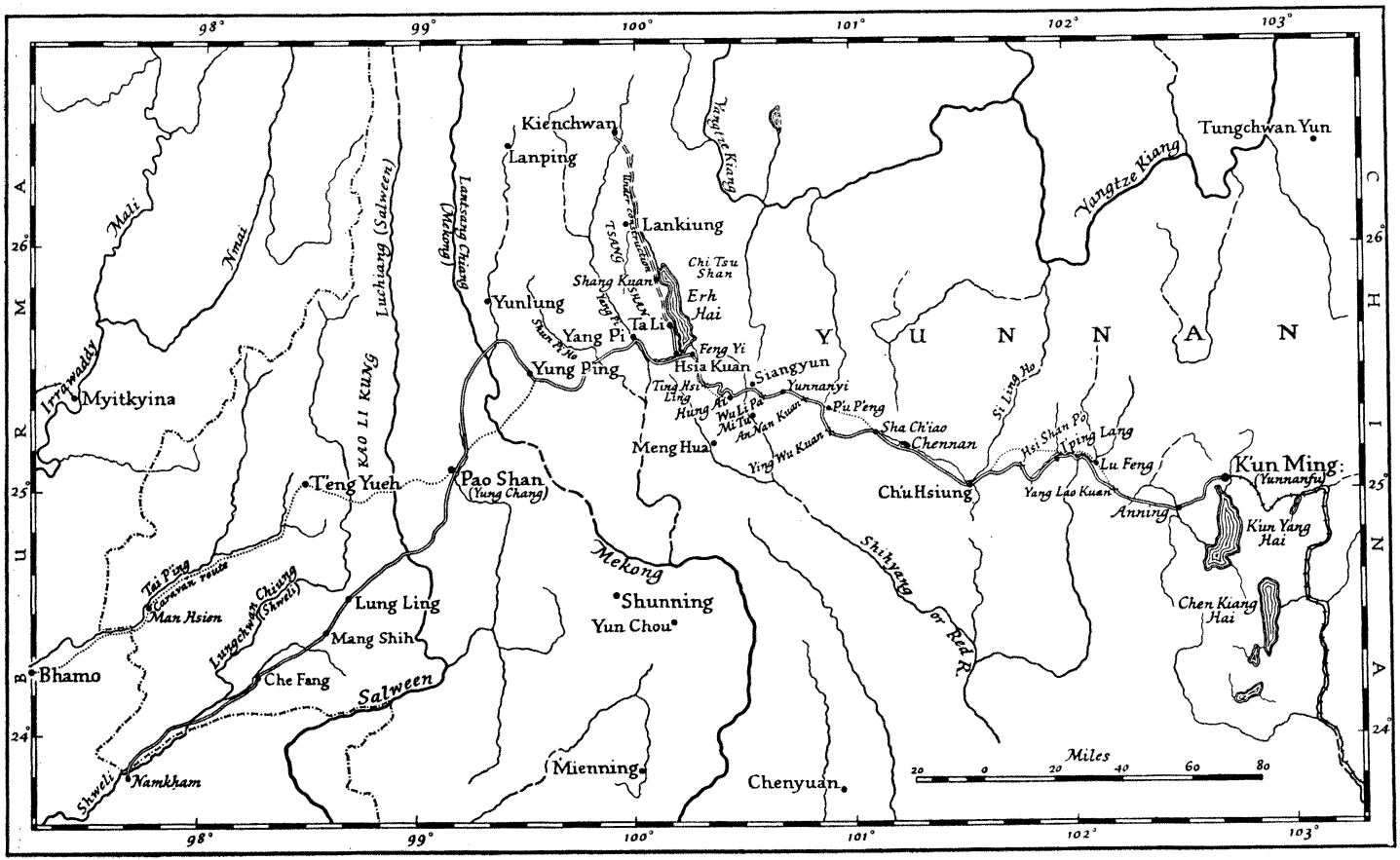
The difficulties which the Chinese engineers had to overcome were not only of Nature's making. Western Yunnan is sparsely populated, and labour had to be brought from places more than 100 miles distant from the line of the road. This labour was of course forced, each village and district being bound to supply a fixed number of workmen for a settled period, usually one month at a stretch. The labourers were mountain folk, many of them non-Chinese tribesmen who had never seen a wheeled vehicle of any kind, much less a motor car. Machinery and even tools were almost wholly lacking. The men carved the road out of rocky mountain sides with hoes and primitive hammers,

carried the road metal up from distant river beds in small wicker baskets, and rolled it with huge stone rollers hand-chipped from granite boulders. Working far from even the tiny villages of that empty land they had to camp out in bivouacs of branches and grass along the road itself, often at high altitudes where in winter the temperature at night is well below freezing-point.

In addition to these formidable handicaps the topography of western Yunnan seems designed by nature itself to hamper all communication between Burma and Yunnan. The province of Yunnan is a plateau forming the most southerly extension of the central Asiatic massif, a south-eastern projection of the Himalaya. At the eastern end of the great ranges which form the northern frontier of India there is a gap at the angle where the main chain of the mountains bends north to form the escarpment which divides the Tibetan plateau from western China. At this point four great rivers break through southwards to the sea: the Brahmaputra, the Salween, the Mekong, and the Yangtze. The first lies wholly in India, but the course of the other three lies across, or rather through, the Yunnan plateau, for all three run in deep gorges several thousand feet below the level of the plateau itself. Between these rivers high ranges rib the plateaux from north to south, cutting it into isolated sections. Other rivers of less size, such as the Shweli, a tributary of the Irrawaddy, the Red river, which reaches the sea in French Indo-China, and the West river, flowing out at Canton, rise on the Yunnan plateau itself and repeat the pattern on a lesser scale. Thus the traveller crossing Yunnan from east to west, or in the reverse direction from Burma to China, is faced with a continuous series of rivers and ranges athwart his route. The caravan roads climb the steep ranges in long flights of broken stone steps, and descend in the same way to a narrow gorge where the river is spanned by an old rickety suspension bridge swung on iron chains. Then once more they ascend, often crossing two such ranges, of about 9000–10,000 feet, in one day's stage. The few towns are built on the lowest slopes of the mountains where the valley widens out to form a narrow lake plateau, for only in such places is there sufficient flat land to grow enough rice to feed the population of a town.

The lake plateaux of Yunnan are as characteristic of the country as the river gorges and mountain ranges. Every city of any size, that is to say of ten thousand inhabitants or more, is built on such a plateau, though in many cases the lake has wholly or partially drained away. Going from west to east, T'eng Yueh, Pao Shan, Ta Li, Ch'u Hsiung, and K'un Ming are all built on lake plateaux, although in the case of the first two there is now no lake. Between these isolated centres of population are long stretches of forest-clad mountain and heath land, almost without any inhabitants apart from the small villages at rare intervals along a caravan route. It is not surprising therefore to find that these lake plateaux are for the most part inhabited by peoples of different stock and were once small independent states. To-day Chinese administration has been imposed on the whole country, and Chinese, the Yunnan variety of the Mandarin dialect, acts as a lingua franca understood by most of the non-Chinese tribesmen, and spoken as a mother tongue by many who are not ethnographically Chinese in origin.

The isolation of the plateaux is the more complete since travel from north



Sketch-map showing the caravan route and motor road from Yunnan to Burma

to south involves as many difficulties as crossing the plateau from east to west. Almost all Yunnan rivers flow in deep gorges, which, except where they widen into plateaux, are usually impassable. Consequently the river valleys are useless as routes. To get from one town to another in the same valley it is usually necessary to climb to the crest of the dividing range, follow along it for many miles, then descend and cross the river, ascend the range on the farther side, follow along that crest for the rest of the day, and finally descend to the stage point in the same valley from which one started in the morning. Journeys in Yunnan give a new meaning to the phrase "the eternal hills."

It is hardly surprising that, in a country which offers such difficulties, communications had remained till modern times in a most primitive state. In all the vast expanse of western China covered by the provinces of Yunnan and Kueichou, from Ch'ung King on the Yangtze to Burma, there was till barely five years ago no road on which any wheeled vehicle could pass. West of K'un Ming, which since 1907 has been connected with Hanoi by a narrow-gauge French railway, none of the inhabitants had ever seen a wheeled vehicle of any kind. The Yunnanese travelled either on the back of their astonishingly nimble and indefatigable little ponies, or on foot. All freight was carried by porters or pack animals, for there are no navigable rivers or streams in Yunnan. The roads, or rather paths, were once paved with heavy slabs of stone, but as repairs were never carried out the paving soon became irregular and broken to the last degree. The Chinese themselves have aptly described these roads in the common saying that they are "good for ten years and bad for ten thousand." Baber, one of the first British Consular officials to cross Yunnan in the 'seventies, has described them feelingly in his report of that journey: "If the British citizen at home wishes to get an accurate idea of travel on Yunnanese roads, let him empty half a ton of broken bricks and the contents of his rubbish bins on the back stairs, turn on all the taps, and climb up and down for seven hours on end, with only one halt of an hour for lunch." This description, accurate as it is, leaves out the great compensation of Yunnan travel: the unmatched beauty of the scenery.

It was military necessity which first induced the building of motor roads in west China. The Central Government's campaign against the Communist insurgents in the years 1935 and 1936 extended the formerly rather tenuous authority of the Nanking Government over all the western provinces. The necessity of moving troops into this region to follow up the retreating Communists led to the first construction of motor roads. The eastern section of the highway between Burma and Ch'ung King, that part which crosses the province of Kueichou and connects the Yangtze city with K'un Ming, capital of Yunnan, was ready for traffic early in 1935, and some parts of the route had been opened earlier still. A beginning had also been made with the western section, which is what is generally meant by the term "Burma–Yunnan road." On the direct order of Chiang K'ai-Shek, after his visit to K'un Ming, this road was pushed on as far as Hsia Kuan, half-way to Burma. Beyond that point the military necessities of the anti-Communist war did not require any road, and no further work was done until the war with Japan made it imperative to prepare a route which could not be cut by the sea power

of the enemy. It is with the purely Yunnanese sections of the road, K'un Ming to Hsia Kuan and Hsia Kuan to Burma, that this paper deals.

K'un Ming, formerly Yunnanfu and still better known to Europeans by that name, is by far the largest city in Yunnan, although until the outbreak of the war with Japan it remained a sleepy and half-forgotten provincial town in spite of the railway connection with Indo-China. K'un Ming is built not far from the shore of a large lake, the K'un Yang Hai, which is nearly 40 miles long and about 3–5 miles wide. The wide plateau of fertile rice land which stretches to the eastern shore of this lake is at first sight extraordinarily reminiscent of some landscape in Provence, for it is crossed with long lines of cypress trees. It is only at close view that one discovers that these do not border long straight roads, but a system of canals which carry the streams from the eastern hills across the plain to the lake, and make possible the systematic irrigation of the whole flat expanse. This irrigation system is said to be very ancient, dating back to the first Chinese settlement in the region, in the second century B.C. The southern European aspect of the K'un Ming plain is enhanced by the absence of any high ranges, for although the plateau is 6400 feet, the hills surrounding it are comparatively low, not exceeding 8000 feet, or 1500 feet higher than the plain itself.

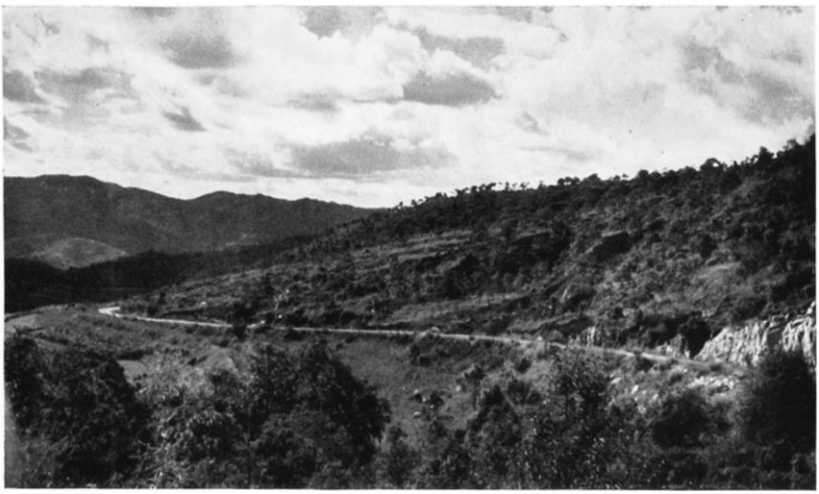
The road to Burma crosses this plain for about 12 miles before climbing a low pass near the head of the lake, a point, still well in sight of the city, which is the midday halt for caravan traffic on the first stage west. For 60 miles west of K'un Ming the road traverses an upland region of rather bare rocky limestone hills and open heath covered with azalea and screw pines, the characteristic Yunnan tree with a corkscrew-like twisted growth. This eastern part of Yunnan is less cut up by cross ranges than the country farther west, consequently the construction of the road as far west as Lu Feng, the third caravan stage from K'un Ming, presented little real difficulty. But at the pass of Yang Lao the road descends sharply by many hairpin bends into the valley of the Lu river, which is some 2000 feet below the level of the plateau. Lu Feng, a small walled city built at the mouth of the river gorge, was for some time the end of the motor road, and up to the spring of 1938 the end of the metalled road surface. Beyond this point the road was a mud surface only passable in winter, which in Yunnan is the dry season. This little town also enjoys the unusual distinction of being one of the few places which successfully resisted the Communist troops during the invasion of 1936, when the Red army passed rapidly across Yunnan to seek refuge in the Tibetan border lands. The small garrison of Lu Feng held the town for two days until the Communists were driven off by the Central Government's air force.

It is west of Lu Feng that the real difficulties in road building began. The old caravan route, which the motor road had hitherto followed, led through the narrow gorge of the Lu river and then abruptly climbed the steep range on the northern bank. As this was not a possible line for any motor road it was necessary to carry the road up the river valley for about 40 miles, all of which had to be cut out of the cliff-like faces of the gorge. The river itself is here crossed three times by well-built stone bridges, which recently replaced the temporary wooden ones of 1936. At the head of this valley lies the high wooded range called the Hsi Shan P'o, or Western Mountain, the divide

between the Yangtze and Red river basins, which up to a few years ago was a notorious stronghold of bandits. This range rises to about 9000 feet, and, being flat-topped, the road is carried for several miles along the crest among pine woods and rhododendrons. The descent to the lake plateau of Ch'u Hsiung is in wet weather one of the worst, for this mountain is what the Yunnanese call a *t'u p'o*, a clay slope, with very little rock in the soil, and consequently in wet weather landslides are frequent. The road has to descend by a series of hairpin loops, one above the other, so that bad landslides tend to carry away two or more loops. Until the road was metalled in the spring of 1938 this spot was always impassable during the summer and in winter after snow falls.

Ch'u Hsiung is the sixth stage on the caravan road, and though only 167 miles from K'un Ming, few cars ever get farther than this on the first day out. The little city has become very prosperous since the motor road came there, and still more since the Central Aviation School, the Chinese Cranwell, built a training aerodrome on the sandy plain outside the city. Ch'u Hsiung is a Chinese town, although the people of the mountains round about are for the most part Lolos and Li Su, and for centuries it was the farthest Chinese outpost when western Yunnan was under the independent Shan kingdom of Nan Chao.

The section westward from Ch'u Hsiung to Hsia Kuan, almost exactly 200 miles, is mostly very wild uninhabited country, with four high passes to negotiate. The first is 40 miles from Ch'u Hsiung near the village of Sha Ch'iao, Sand Bridge, where the road leaves the valley of the Yangtze tributary, the Si Ling Ho, and corkscrews up the steep range to Ying Wu Kuan, the Parrot pass. I have never seen wild parrots there, although they are common in some parts of Yunnan, but though there are no parrots to be seen, there are great numbers of scarlet rhododendron bushes growing on a limestone range, contrary to the general belief that this shrub does not naturally grow in a lime soil. Here for nearly 50 miles the road passes through country in which there is not a village or even a house, for the few Li Su who live in these mountains seem anxious to avoid the road as far as possible, perhaps for fear of being made to work on it. The only settlement is the small town of P'u P'eng on the far side of the Ying Wu Kuan, the ninth stage on the caravan road, and a very long one, for it is 30 miles across thickly forested mountains from Sha Sh'iao. P'u P'eng is merely a hill village and halting-place set above a narrow valley which drains into the Red river, since Ying Wu Kuan is a Yangtze–Red river divide. Immediately across it the road winds up the second pass, An Nan Kuan, or the Annam pass as we would say, so called because this also divides the waters of the Yangtze basin to the west from those which drain to the Red river and so to Annam. The road along the whole way from K'un Ming to Hung Ai is thus constantly crossing and recrossing ranges which form the Red river–Yangtze divide. An Nan Kuan leads down to the dry lake plateau of Yunnanyi, the region "south of the clouds" from which the name of Yunnan, now used for the whole province, originally derives. This district, having a much higher range to the west which intercepts the monsoon rains, has a very dry climate and it is not possible to irrigate the whole plain. As it is thus one of the few areas of



Yang Lao Kuan

Pack horse road over Ying Wu Kuan

Motor road over An Nan Kuan

Yunnanyi

The Tsang Shan from Yang Pi

Lung Wei Kuan, near Ta Li

dry flat land in Yunnan, it was easy to use part of this plain for an aerodrome which has given a new importance to the little village of Yunnanyi.

About 12 miles west of Yunnanyi the road passes a famous limestone cave which is reputed to be a very great size. The entrance is wide and high, and it is certainly possible for more than two hundred people to shelter in the part which it lights. Farther in it breaks up into many galleries which, being pitch dark and partly flooded with rain water, I never had time to explore. Recently the military authorities decided to close the cave and use it for a munition dump; being handy for the road, and certainly bomb proof, it would be very suitable if Japanese aircraft ever get so far west as this. At this village, Ch'ing Hua Tung, the line of the Burma–Yunnan Railway, which the Chinese are now constructing, diverges from that of the motor road. From K'un Ming to Ch'ing Hua Tung the railway will follow the line of the road in so far as the necessity of tunnelling the mountains will permit, but from here the railway will turn south to Meng Hua and Mi Tu, and thence by Yun Chou to the Kunlong ferry on the Salween, which is at that point the frontier of Burma and Yunnan. This route is some 100 miles and more south of the road, and for the most part will pass through very sparsely inhabited country with few towns. Although it will therefore be of little value to the people of west Yunnan the proposed route is by far the easiest way, as it avoids three of the main mountain ranges and crosses the Mekong and Salween where those rivers are more easily accessible. With a few minor changes this is the route surveyed by General Davies and his collaborators in 1905.

After Ch'ing Hua Tung the motor road descends by the low pass of Wu Li Pa, the Five Li Hill, to the lower plateau of Hung Ai, which is not more than 5000 feet above sea-level. This plain lies immediately under the great Ting Hsi Ling range, which is the Red river–Mekong divide and in which the Red river rises a few miles north of Hung Ai village. The Ting Hsi Ling rises to 10,000 feet close to the point where the road crosses it, about 1000 feet lower, probably the highest point on the road between K'un Ming and Burma. The difficulty of crossing this range is due to the fact that there is really no pass at all on the eastern side. The caravan road climbs up 4000 feet in what is nothing more than a long flight of broken stone steps, and slides of mud where the steps have disappeared. The road has to climb the same slope by hairpin loops which are frequently carried away in the rains by landslides. On the western side, by contrast, the descent to the plain and lake of Ta Li is a long gentle valley between well-wooded mountains, the contrast being explained by the fact that the Ta Li plain lies 1700 feet higher than that of Hung Ai, at 6700 feet.

The region west of the Ting Hsi Ling and northward to the Yangtze is the land of the Min Chia, a non-Chinese people who have absorbed Chinese culture to a great extent but still retain their own language and certain distinctive characteristics in their social organization and religion. They also retain the good rice-growing land of the plain, unlike almost all other non-Chinese peoples who have been driven up to the mountains. Their chief centre is the city of Ta Li, which lies 10 miles north of the main road to Burma, but is now connected by a branch road which it is hoped one day to

extend northwards to Li Chiang on the borders of Tibet. Once the capital of the kingdom of Nan Chao, and still famous all over China as the source of the celebrated Ta Li marble, pieces of which were even dragged to Peking to adorn the Forbidden City, Ta Li is the most beautiful place in Yunnan, which is to say one of the most beautiful places in the world.

The Ta Li area is a perfect example of the self-contained lake plateaux of Yunnan. To the west the Tsang Shan range, which rises to 14,000 feet, the highest mountain on the line of the Burma road, and to the east the foot-hills of the Ting Hsi Ling, make barriers which can only be penetrated at three points. The Tsang Shan range runs north and south for 30 miles without a break, a giant upthrust of granite which dominates the country for miles around. On horseback one first sees Tsang Shan from the east at the top of An Nan Kuan, four days' journey from Ta Li; to the west it can be seen from the mountains overlooking Pao Shan, eight days' journey from Ta Li. At the foot of the mountain lies the long strip of lacustrine plain, never more than 3 miles wide, almost perfectly flat, and cultivated to the last inch. Beyond the plain the bow-shaped, or rather, as its name Erh Hai implies, ear-shaped lake, varying in width from 2 to 5 miles, stretches north and south for 25 miles, bordered on the east by arid rocky hills, which rise to the higher wooded holy mountain of Chi Tsu Shan, the Chicken Foot mountain, a name derived from the configuration of the five ridges which compose it.

Not only is the Ta Li plateau cut off by wild stretches of wooded mountain land extending in some directions for 50 miles; it is also confined by two very narrow passages between the Tsang Shan range and the lake, respectively at the northern and southern extremities of the plain. These two passes, called with characteristic Chinese imagination the Dragon's Head pass and the Dragon's Tail pass (Lung T'ou Kuan and Lung Wei Kuan), are defended by two fortresses, the Upper and Lower Barrier, Shang Kuan and Hsia Kuan, the last named lying on the direct line of the Burma road. A novelist describing an imaginary country would be accused of fantasy if he invented topography so perfectly suited to defence as these two entrances to the Ta Li plain. At Shang Kuan, the northern pass, where the Erh river flows into the lake, the Tsang Shan range is lowest, yet as if to counteract the opportunity which this might afford to an invader, it is more precipitous than elsewhere, and its side is split by a narrow deep ravine, quite impassable without a bridge, which runs down almost to the edge of the lake. The inner lip of the gorge is defended by a miniature Great Wall in the Chinese manner, and the small gap where the ravine reaches the lake is closed by the solid walls of the old fortress of Shang Kuan, built on the water's edge. Man has here put the finishing touches to nature's work, but at Hsia Kuan man had hardly anything to add. At the southern end of the lake the lower Erh river drains westward through a slit in the mountain which at its narrowest point is only 10 feet across; the river itself being bridged by a great boulder wedged between the cliffs, called T'ien Sheng Ch'iao, the Heaven Built Bridge. A narrow passage above this boulder, probably an earlier channel of the river itself, was until 1938 the only entrance from the west to the Ta Li plain, the gate through which the caravan traffic to Burma has passed for many centuries. On the inner bank of the river, above this gorge, where the current is

fast and deep, the fortress of Hsia Kuan guards an old stone bridge which is the only passage to Ta Li from the east and south. Thus not only the Burma road from west to east, but also the tea road to Tibet from south Yunnan, passes through Hsia Kuan. In order to make a roadway for vehicles it was necessary to blast away the cliff face opposite the Heaven Built Bridge for nearly a quarter of a mile. This was therefore one of the worst obstacles encountered in opening the Burma road for wheeled traffic.

It is not surprising that the Ta Li plateau was from very early times considered an ideal seat for kings, and that Ta Li city was for more than a thousand years the capital of the kingdom of Nan Chao which held most of the modern province of Yunnan.

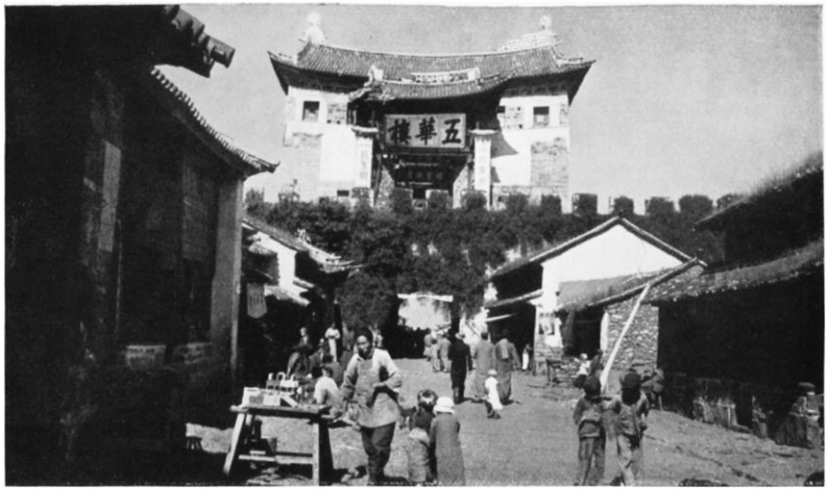
Lung Wei Kuan, the Dragon's Tail pass, was an obstacle which the road engineers did not attempt to pass until the Japanese blockade made a road to Burma a vital necessity. Not only this gorge but the whole country west of Ta Li is far more difficult than the eastern section of the road. As one goes west in Yunnan the ranges are steeper and higher and the valleys more deeply cut; the rainfall is therefore heavier, since Yunnan receives the Indian monsoon from the south-west. Consequently the snow-line is lower in western Yunnan than in the Tibetan marches to the north-east. Ranges in eastern Yunnan like the Ting Hsi Ling at 10,000 feet are only occasionally covered with snow, but the Kao Li Kung just east of T'eng Yueh, 200 miles to the west, which is about the same height, is often covered with snow for months on end. The fact that the mountain tops receive far more rain than the plateau causes a curious inversion of the ordinary expectation that as one climbs higher the vegetation will be thinner and stunted. In Yunnan the trees grow higher as one ascends. At 6000 feet, the level of the plateau, there are only the screw pines and dwarf azalea scrub, but at 10,000 feet there are large deciduous trees like chestnuts, tree rhododendron, cedars, and several kinds of what appear to be ilex. Between 10,000 and 15,000 feet there is dense rain forest of magnolia, cedar, bamboo, and rhododendron, with the ilex and certain deciduous trees also. Tsang Shan is covered with rain forest to the very crest, and it is only such mountains as Yu Lung Shan, near Li Chiang, which is probably over 20,000 feet, that rise above the tree-line.

From Hsia Kuan to Pao Shan, a distance of about 180 miles, the motor road follows fairly closely the line of the caravan track, except at the crossing of the Mekong. Here, as the caravan road descends an almost sheer face for 2000 feet, it was necessary to make a wide detour, and the road crosses the river by a new suspension bridge about two stages north of the old Mekong bridge. When I passed through this country in December 1938 motor traffic was not yet open to the public, and travelling by caravan one had not always an opportunity of observing the line of the motor road. For two stages west of Hsia Kuan both roads follow the narrow valley of the lower Erh river and then turn up the valley of the Yang Pi river to the town of the same name. Although this place is two days' journey from Ta Li it is on exactly the opposite side of Tsang Shan, not 10 miles from Ta Li as the crow flies. For Tsang Shan, although the highest mountain in western Yunnan, is not a watershed of any importance. It divides the Erh Hai lake from the Yang Pi valley, but the Erh Hai drains into the Yang Pi river, which is a tributary of

the Mekong. Tsang Shan is in fact a geological freak, the only upthrust of granite in Yunnan east of the Salween, and its strata tilted vertically show that it must have been the consequence of some violent convulsion.

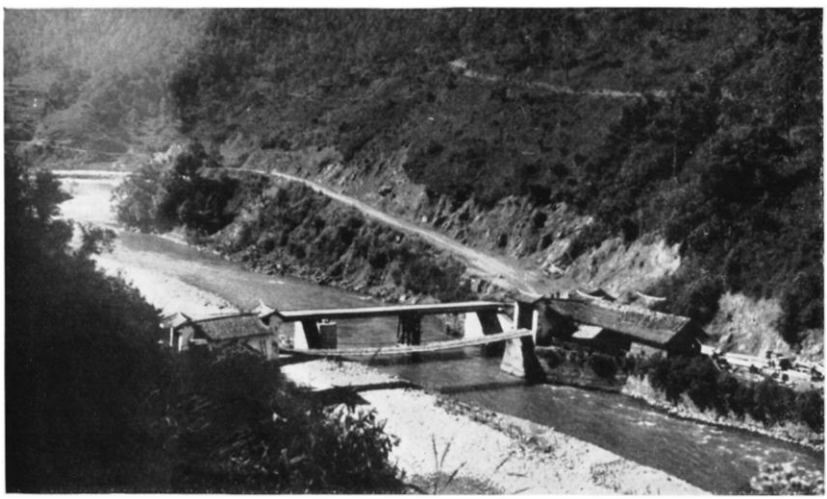
The road west of Yang Pi passes for six stages through a wild tangle of heavily forested ranges dividing various small tributaries of the Mekong. The only town is Yung P'ing, a centre of the Yunnan Moslems. This almost uninhabited district is the western border of the Min Chia country. Even upon the caravan route itself there are hardly any villages, and at the fourth stage from Ta Li there is literally only one farm-house, with accommodation for at most ten people. Those who get there first have a choice of two rooms, a loft and a stable. Those who arrive later can either camp in the inn yard with the mules or out on the mountain side. The place lies high, at least at 9000 feet, and the nights can be very cold. I arrived in time for the stable. The caravan traffic on the Burma road is surprisingly heavy when one considers the immense distances covered and the few towns along the route. Most of the traffic is Szechuan silk, which is shipped at Bhamo for the Indian market. These bales of silk, weighing about 100 lb., are loaded on mules at Sui Fu on the Yangtze above Chung King, and taken by the first caravan twenty days' journey to Chao T'ung, in north Yunnan. There caravans are changed and the silk is carried down to K'un Ming, another fifteen stages. From K'un Ming, Ta Li men take it to Hsia Kuan, a further thirteen days' journey, and from Hsia Kuan another set of muleteers, usually Moslems from the Ta Li district, take it to T'eng Yueh, fourteen stages. The last lap of seven stages down to Bhamo is undertaken by T'eng Yueh men whose mules are accustomed to the heat of the Burmese plain. These bales of silk thus travel for seventy stages to reach Bhamo, a distance of more than 600 miles, which is probably one of the longest pack routes still in operation. On their return journey the mules bring up cotton thread for the innumerable hand-looms on which the Yunnanese still make most of their own clothes.

Pao Shan, which was formerly called Yung Chang, and is Marco Polo's Voo Chan, is the largest city between K'un Ming and Mandalay, although it has a population of not more than thirty thousand at the most. Until 1939 it was at best nine days' ride and three days' bus journey from K'un Ming, and until two or three years ago it was twenty-three stages from K'un Ming. It was therefore sufficiently remote to be considered by the Manchu government a suitable place to exile political dissidents, usually from the region of Nan-king. Consequently the population of Pao Shan to-day speaks the mandarin dialect of the lower Yangtze provinces and is in fact largely descended from these exiles. The original population, which was probably of Li Su stock, has now retreated into the mountains and the wide and fertile plain is settled by Chinese. At this place the motor road turns south to Lung Ling and the Chinese Shan states of Che Fang and Mang Shih, this route being considered easier than crossing the Kao Li Kung range to T'eng Yueh. The merchants of the latter place, for centuries the entrepôt of the Burma trade, are seriously disturbed at this detour, and talk of subscribing enough money to build a road down to Bhamo and across the Kao Li Kung to Pao Shan. If this is done it will be an undertaking much more formidable than any other part of the road, for the Kao Li Kung range, the Salween–Irrawaddy divide, is



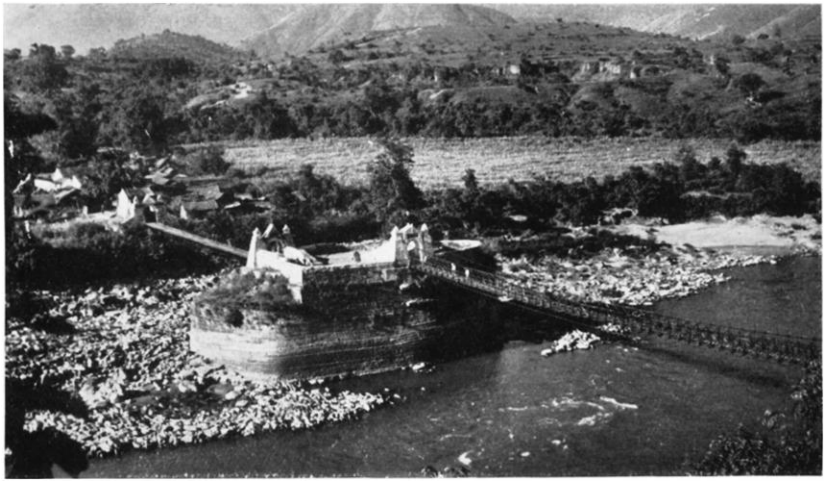
The Tower of Five Glories at Ta Li

The pass west of Yang Pi



The motor road and pack horse bridges over the Shun Pi Ho

The plateau of T'eng Yueh



The Salween bridge

The Tai P'ing near T'eng Yueh

almost a sheer wall rising 6000 feet above the Salween valley. The caravan road which crosses the Salween by a suspension bridge climbs this range by what is nothing but a long stone staircase winding up a narrow cleft. No motor road could be constructed here unless the cliff face were blasted out every foot of the way.

West of Pao Shan, and especially west of the Salween which is two stages from Pao Shan, the character of the country changes. One is conscious that it is no longer quite the usual Yunnan scene. The Salween valley itself, famous for its malaria and shunned by the Chinese, is only 2000 feet above sea-level, whereas the Mekong stands at 4000 feet. Here one begins to see new trees and fruits. The banana, which in Ta Li is a curiosity, is everywhere for sale. The Kao Li Kung is covered with a dense forest of immensely tall evergreen trees, unlike any seen in other parts of the journey, and the forest is full of howling gibbons who follow the slow ascent of the caravan, invisible but very audible. Two stages from the Salween one comes to the last lake plateau of Yunnan, that of T'eng Yueh, although there is now no lake. T'eng Yueh is generally famous for three things: the waterfall, which is very beautiful, the city wall, which does not enclose the city, and Ma An Shan, the only extinct volcano in China. No one seems to know why the town or T'eng Yueh is built almost entirely outside the city wall, within which there are only a few government buildings and temples. Perhaps it was originally the Chinese stronghold, and the local Shan populace were either not allowed or did not wish to live inside the fortress.

T'eng Yueh is also the last centre of Chinese colonization. The seven stages to Bhamo are through the Chinese Shan states, tributary principalities ruled by Sawbwas as on the Burmese side of the frontier. After T'eng Yueh one is still politically but not ethically or culturally in China. The Shan villages, with their Buddhist temples in the Burmese style and their yellow-robed monks, are wholly alien to the Yunnan plateau, and as the road descends the valley of the Tai P'ing river, instead of climbing up and down mountains, the characteristics of true Yunnanese travel disappear. Four days from T'eng Yueh one comes to the village of Man Hsien, a name which, sadly uncomplimentary to the British Raj, means Barbarian Limits. It is the last town in China.

Even before Man Hsien is reached the country has become dense jungle, an almost solid wall of bamboo and banana and towering trees which throw the path into deep shade. About 10 miles below Man Hsien, in the heart of the jungle, unmarked by post or placard, unguarded by any house or soldier, there is a small iron bridge across a stream. That is the frontier between China and the British Empire.

DISCUSSION

Before the paper the PRESIDENT (Field-Marshal Sir PHILIP CHETWODE) said: I have pleasure in introducing to you Mr. Patrick Fitzgerald, who has in recent years been following his anthropological and geographical researches and is peculiarly well qualified to speak to us on the subject of Ta Li and the Burma–Yunnan road. It is a road about which we have heard much since the outbreak of the war between China and Japan.

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

Mr. E. H. KEELING: I went a few miles into China along the Burma–Yunnan road a little over twelve months ago. It is interesting to note, and I was rather surprised that the lecturer did not mention, that at the Burma end the road is connected not only with Bhamo on the Irrawaddy but with Lashio on the Burma railway. It is possible to go from Rangoon to China either by steamer up the Irrawaddy to Bhamo and then by road, or by rail to Lashio and then by road. The existence of this second route more than doubles the value of the road to China, because whereas the river route to Bhamo takes anything from one to two weeks, the railway from Rangoon to Lashio takes only one day. It is of undoubted value to China to have both routes in case either river or railway should be interrupted.

Mr. FITZGERALD: I am glad to hear that because, as I explained, the motor road was not open when I was in the area. I was unable to go by road over the last section of the route. From Pao Shan we went by horse and did not see the actual road at the point where it joins the frontier at Namkham.

Asked in what seasons the road was open and how transport was affected by climatic conditions,

Mr. FITZGERALD replied: The road is supposed to be open the whole year round. In rainy periods in summer it is of course going to be washed away in the mountain passes once or possibly twice a week. The idea is to have one hundred men every mile or so to repair the road as soon as it is washed away. That will be done by forced labour and I understand that, except for a short time, the road was in fact kept open in the summer of 1939. The eastern section as far as Ta Li, which was opened in 1936, was kept open for nine to ten months each year. After the outbreak of war between China and Japan it seemed more important to keep it open longer and it was only closed for three weeks during 1938. I should say July, August, and September are the most difficult months; October is also frequently a difficult month. Western Yunnan has the monsoon climate of India, and if the monsoon breaks in May the road may be washed out in the middle of that month. If the monsoon holds off there may not be serious rains until the end of June. Once it breaks the monsoon sometimes continues until the end of October, sometimes only to the middle of September. August and July are almost certain to be months of heavy rain.

Asked if he made the journey from Ta Li partly by motor car and partly by mule,

Mr. FITZGERALD replied: I have travelled the road from Ta Li to Yunnanfu seven times, all but twice by motor car. I travelled from Ta Li to the frontier by mule because motor traffic had not commenced in that section.

Dr. DUDLEY STAMP: A little over a year ago I had an opportunity of going over most of the roads of Burma leading to the Chinese section, when I had the interesting experience of wet weather in the dry season, with the result that we were held up for some days. One naturally formed the opinion that the utilization of the road, even the motor road, will probably have to depend very much indeed upon weather conditions. Motoring over the new motor road is still something of an adventure, at any rate to those used to conditions in western Europe. Can the lecturer assess the real value of the road for transport purposes, apart from an emergency? The road is frequently referred to in newspapers as "the new back door into China," as if in the future it is going to be an important artery of commercial traffic. Having seen the type of country portrayed on the screen one is inclined to ask whether there is serious justification for regarding the motor road, interesting as it is, as an avenue of any considerable body of trade in the future.

Mr. FITZGERALD: As a military road intended for the transport of munitions

its value lies in maintaining a stream of supplies. As an aid to commerce the road has practically no value because there are no inhabitants most of the way along it. Where there are any they have no purchasing power, and such as travel would never dream of going by bus or motor car if able to walk, as they have been accustomed to do all their lives. The eastern section of the road which has been open for three years carries hardly any freight; all the freight goes by mule.

Mr. KEELING: I can say that many thousands of tons of munitions went into China *via* Burma during 1939.

Sir ERNEST WILTON: I have doubts whether thousands of tons went that way and arrived at their destination. The road has been boomed a good deal, but it can hardly be regarded as a success, even as an emergency road. Comparatively speaking, there is only a trickle of stuff that gets over it, nor is it at all likely to develop into a permanent motor route or railway. Burma is unfortunately situated as regards Yunnan and the Chinese provinces beyond. The physical geography of western Yunnan constitutes a very formidable obstacle to transport of any kind, and it is necessary to climb up and down across very difficult country to the central plateau of Yunnan before being able to secure such trade as is available over and above the small amount in the west. Indo-China has a less difficult access to central Yunnan from the south, and the French about thirty years ago constructed a subsidized railway from Laskai on the frontier along the Red river to Yunnanfu. It was a good many years before it could pay even interest on the capital, and the average monthly freight has been 3000 tons until last year when it jumped to 20,000 tons because of hostilities between China and Japan. As regards British trade from the Burma side with Yunnan and beyond to Szechuan and Kueichou, I am afraid that it would be hopeless to regard the motor route as a paying commercial proposition.

Mr. FITZGERALD: I would not say that. The silk from Szechuan does in fact go out from Bhamo by mule. The whole of the caravan traffic from western Yunnan is entirely outward from Szechuan. It is taken in stages from Szechuan to Bhamo. There are two series of fourteen and thirteen-day stages to Yunnanfu; thirteen days to Ta Li; fourteen to T'eng Yueh, and seven days to Bhamo. The bales of raw silk are carried the whole way to Bhamo on mule-back and then loaded on to the river vessels and taken to Rangoon. One sees at certain camping points, such as the Salween bridge, as many as 400 to 500 mules together in one day. There are four or five caravans each day in the dry season.

Mr. GERALD SAMSON: Is it not also a fact that Burmese cotton goes over the road into Yunnan?

With regard to Sir Ernest Wilton's remarks, as to the commercial value of the Burma road, may I say that before journeying over it in February 1939 I had spent three years in China. Since the Sino-Japanese conflict began in 1937, I have travelled extensively in the south-western provinces of new China—Yunnan, Kueichou, and Szechuan, three of the richest in the Republic—where economic reconstruction and development is progressing at a rapid rate. In due course the rich mineral resources of this and other areas will be opened up. All but coal and iron will be chiefly mined for export, and their logical outward route is over the Burma road which by then will be a first-class all-weather highway. When the war is over, the traffic into China will consist of manufactured goods of all descriptions, mainly British, I suggest, if we are alive to our opportunity. Moreover I venture to predict that there will come a time when the growing prosperity and purchasing power of the inhabitants of this new market will reach a volume that will not only tax the capacity of the Burma road, but also of the Yunnan–Burma railway now under construction.

The great benefit of this trade to Burma is self-apparent, and in addition, there is every reason to anticipate a steady increase during the coming years in the amount of Burmese cotton used by the Yunnan cotton mills, whose output is being expanded as quickly as new machinery is laid down. I am therefore personally convinced that every day and in every way the Burma–Yunnan road is going to become more and more important to both Burma and China.

Professor C. G. SELIGMAN: Mr. Fitzgerald said nothing concerning the anthropological side of his expedition, so I must mention that. I have to congratulate him on two counts: on his excellent anthropological work, of which I know something, as well as on his extremely interesting description of his traverse and economic exploration of the new road and its possibilities. We are very lucky in this Society to have men as many-sided as Mr. Fitzgerald, for it must not be forgotten that he is, or was, primarily an historian.

The PRESIDENT: It is somewhat curious that there are in this hall five people who have been to the remote part of the world the lecturer has described. And, curiously enough, I make a sixth. I was there so long ago that I do not like to think about it. I was with the Kachin expedition and then in the Shan States, so I know the country intimately.

I noticed the difficulty experienced with the mule-drivers. I was a transport officer when I first went to that part of the world, and we used to deal with Panthay Chinese mule-men. At that time we were liable to be shot at because we were opening up new country. When the mule-drivers wanted to feed their mules at any time of the day they outspanned them and just turned them loose, regardless of the tactical situation. Sometimes we had to picket the hills at great inconvenience. When it was time to gather the mules together again the driver got hold of a bell-mule and began making curious outcries, whereupon the mules all came back from the jungle. There is another interesting feature about transport in that remote part of the world to which the lecturer did not refer. He showed photographs of mule-loads on the ground. The soldiers in this audience will know how distressing mules are to deal with. There is a saddle on the animal to which the load is strapped directly. Frequently the mule objects very strongly, and kicks and bucks until the load is off. But the Chinese mules are extraordinarily well trained. A wooden framework is put on the ground and the loads are fastened to it before the mule appears. The driver then brings the mule up, the animal puts its head down and walks along, and two men lift the load up on the framework and set it down on a sort of cushion on the mule's back.

The last time I went up to Lashio I was Commander-in-Chief. I remember receiving a message from a Chinese general on the opposite undemarcated part of the frontier, on the other side of the Salween, who gave the British five days to leave the part of the country in which I was. Needless to say we did not leave, as we were well within our side of the boundary. Since then the boundary has been properly demarcated by an international boundary commission.

All I have to do now is to ask you to accord a hearty vote of thanks to the lecturer for his most interesting lecture.

Note on the spelling of names

The names in Mr. Fitzgerald's paper follow the Wade-Giles romanization. The P.C.G.N. recommends the forms used by the Chinese Postal Guide, which does not distinguish between hard and aspirated initials. Thus the Guide would spell *Ch'ung King* as *Chungking*, *P'u P'eng* as *Pupeng*. Not all the names which occur in such a paper can be found in the Guide.

the following spring, and William Nicholson, by then Dean of Carlisle, replied as follows: "About the English Atlas there were only four volumes finished. I wrote two of them: those that refer to Germany. Mr Perse [Peers] one of our Esq. Bedels wrote that of the Low Countries. The first volume was by several hands: the Introduction by a Fellow of Pembroke College: Greenland, Russia and the countries under the Pole were described by Obadiah Walker: Sweden by Dr Todd, then Fellow of University College, now one of our Prebendaries at Carlisle: Norway, Iceland, Denmark and Poland were done by me. Dr Lane of Merton began a volume of the Turkish Empire: and Moses Pitt (the undertaker) treated with me for finishing that part. In order to which he sent me down the Doctor's sheets, and I had provided such helps as I thought might enable me to bring it to perfection. But soon after my friend Moses fell into decay, and so the whole design was blasted."

NOTE ON THE CONSTRUCTION OF THE KARAKORAM MAP TO BE PUBLISHED EARLY IN APRIL

SOME years ago there was much discussion at meetings of the Royal Geographical Society and in the *Geographical Journal* on the question of range names in the Karakoram, and it became apparent that a map of the area drawn with special regard to the representation of the higher relief would be helpful in coming to a conclusion. A map was therefore compiled and drawn at the R.G.S. by Mr. F. J. Batchelor, the senior draughtsman, working under the instructions of a Committee appointed by the Council of the R.G.S. and under the constant supervision of Professor Kenneth Mason.

This preliminary edition had a certain number of peak, pass, and river names, enough to make the country recognizable. It was circulated to many travellers who had contributed to discussion of Karakoram Range and Peak names, and their suggestions were considered by a Conference in London between representatives of the Survey of India and the R.G.S. during the winter of 1936–37. A full account of the preliminary work and the Karakoram Conference Report was published in the *Geographical Journal* for February 1938. The names now shown upon the map accord with the decisions of this Conference, which were subsequently approved by the Surveyor-General of India.

Meanwhile exploration had been active and considerable additions to the first compilation were made, to include all published results up to Mr. Eric Shipton's Karakoram Expedition of 1937. The Map has been drawn on the principles described in a Note communicated to the International Geographical Congress held at Warszawa in 1934, of which the following is a summary:

Our task was to produce on the scale of 1/750,000 a map of the Karakoram with an altitude range of about 3000 to 28,000 feet. Unrestricted by any conventions we have sought the most graphic method of representing the relations of the high mountains and great glaciers to one another and to the deep valleys which divide the different massifs.

After many experiments we have abandoned the layer system. The strong red or brown warm colours of the normal scale combine badly with the blue and white required in the representation of *névé* and glacier. We tried without success to find a colour scheme which should pass into cold greys for the higher altitudes below the snows. And we concluded also that no layer tints are satisfactory when the contours are close. Unless the distance between contours is at least 5 mm. the tint of the layer is affected by the colour of the contour. Hence we renounce the use of layer colours for the heights, reserving the possibility of using them in the valley bottoms.

In principle we accentuate the mountain slopes, colouring those which are bare in brown on a ground tint of yellow with blue shading of the snows and in addition a general oblique purple shading. The hill shading is in principle cast from the north-west, as is usual; but we reserve the liberty to vary its direction somewhat to suit the ground, as was done long ago by the Swiss cartographers. The system much resembles that used in recent Norwegian maps, adapted to the higher altitudes.

For the valleys we have adopted tints of greyish green and have been careful not to carry the hill shading down into the valley bottoms. The idea was derived from the old habit of the Austrian cartographers in colouring *Thalsohlen* green on maps otherwise uncoloured.

For the names we adopt the new Ordnance Survey alphabet as nearly as we can, and use the one style of Roman and sloping throughout. Peak names are distinguished not by a different character but by writing them along the arc of a circle above the summit, with the height symmetrically below, so that the position of the summit is always in the same relation to the name and the figures. By analogy we write pass names above the pass symbol in the general direction of their route, with the pass height below. The framework of the map is the triangulation of the Survey of India; their topography has been modified and extended by the results of recent expeditions.

The map is printed in eight colours on a sheet with engraved surface 22·7 by 20·0 inches. The scale is 1/750,000 or 11·8 inches to 1 mile. The price of the map is 7*s* 6*d* or 5 Rupees to the public, to Fellows of the Society 6*s*. Copies of the preliminary edition, without mountain names, may be bought from the Office of the Society for 2*s*.

A JOURNEY ALONG THE CHINESE-TIBETAN BORDER

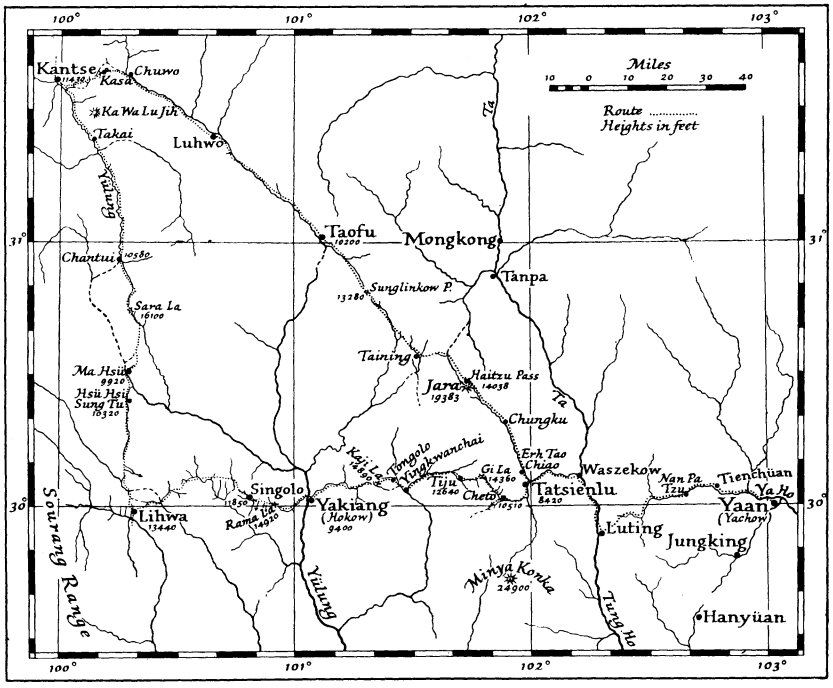
J. HANSON-LOWE

DURING the spring and early summer of 1937 I visited south-eastern Tibet to study geomorphological problems, and particularly the question of Pleistocene glaciation. The results of these investigations will be published later; this paper is merely a general description of the area traversed and the conditions of travel there. The investigation was carried out under a Government grant awarded to me by the Royal Society. I would like to acknowledge my indebtedness to Dr. J. S. Lee, of the Institute of Geology, Academia Sinica, who extended the greatest possible help, particularly in procuring special passports; to Mr. Floyd Johnson, of the S.D.A. Mission, who accompanied me; and to the Reverend and Mrs. Cunningham, of the China Inland Mission at Tatsienlu, whose help and interest can never be forgotten.

To the west of the fertile Red Basin of Szechwan lie the Great Snowy Mountains, the Ta Hsüeh Shan, with Minya Konka rising to nearly 25,000 feet. Still farther west, behind this formidable barrier and reached by passes several thousand feet high, stretches the high plateau of Sino-Tibet with its infinite grasslands, great canyons, and occasional mountain chains that vary its unending undulations. Although more than one route leads from Szechwan to the Tibetan lands, the best known, the most famous historically, and certainly the most practical is that from Yaan (Yachow) to Tatsienlu *via* Jungking, Hanyüan (Tsingki), and Luting. This is of course part of the official highway from Lhasa to Peiping along which tribute was brought to the Chinese emperors. To-day this is still the most significant commercial route with its ceaseless stream of coolies bearing enormous loads, and the track is known locally as the "Big Road." In the course of two journeys to Tatsienlu and back I had the choice of travelling *via* the "Big," the "New," and the "Small" roads. The first has frequently been described; it is well supplied with rather wretched inns, and food is generally plentiful; and it entails two passes of the order of 9000 feet. The New Road is shorter and has been somewhat favoured by the military; there is only one high pass to cross, but for nearly two days there are no inns and only the rarest habitation. The Small Road is a track that is relatively little known and merits a short description.

The first stage beyond Yaan is Tienchüan, reached by following the Ya valley upstream through Cretaceous sandstones and clays, now through a gorge, now through remarkable erosion terraces often under cultivation. Tienchüan lies on the Mo Shui, a tributary of the Ya. Beyond there neither our coolies nor the local inhabitants knew the second stage of our journey. The local authorities sought to make us change our intentions, return to Yaan, and take the Big Road; but my companion, Baron Conrad van der Bruggen, and I were adamant. In the end we were given a guard of ten soldiers and an officer in command, none of whom knew the route. We followed the Mo Shui upstream, along a practically continuous gorge through the country of the tribal Chiangs. Everywhere the slopes are very steep, and tiny cultivated strips are perched often very high, if it is by chance more level.

It is a well-wooded country, but many forest fires were seen. The first night was spent at Tzu Shih Kuan, the second at Nan Pa Tzu. After crossing a col the new valley entered was found to be equally gorge-like, greatly winding, and cutting into granite. We reached the village of Chang Ho Pa in the afternoon, a derelict place after the passage of the Communists. Beyond here there was virtually no cultivation; the stream flowed in a narrow canyon with overhanging rhododendrons in flower. We spent a night at Meng Kai Shan and followed the route up to the Ma An (Mangan) pass, some 10,000 feet high; here, in the teeth of a fierce wind, we enjoyed a magnificent view of the Great Snowy Range, from Minya Konka northwards. At this height there were



Sketch-map of Sikang and Szechwan to show Mr. Hanson-Lowe's route

but stunted trees and low bush, and broad patches of the winter's snow lay about us. Some four hours' descent took us to the great trench of the Tung valley, and at Luting the Big Road was reached. We bade farewell to our bodyguard and, after reaching Waszekow the following evening, ascended the savage gorge of the Ta the next day to Tatsienlu (Dardsendo), former capital of the independent Tibetan kingdom of Chiala.

Tatsienlu is a cosmopolitan border town, deeply set in the steep valley of the Ta. In the two narrow streets, clinging to the valley wall and in peril of slipping into the fierce waters of the Ta that foam between them, there is the strangest assortment of races: Chiangs, Hsifans, Chinese (many from remote Shensi), Chiala Tibetans, and perhaps tribal Chiarongs. Here is the limit of

coolies' endurance; their enormous packs of tea are carried farther west, to higher altitudes, on the backs of yak, whilst they themselves leave this mountain entrepôt with musk and skins, rhubarb and deers' horns, and other medicines for the millions to the east.

The previous summer I had noted cirques and hanging valleys in the vicinity of Cheto hamlet and Tiju, within a day and a half's journey from Tatsienlu. It had not then been possible to examine them, and a preliminary journey there was the first task. I am much indebted to van der Bruggen for practical help on this occasion. The journey was made on horseback, with a Tibetan guide.

At first the track follows upstream from Tatsienlu, but at Ssumachiao it leaves the Ta and follows a narrow canyon westwards to Cheto hamlet. After the bare slopes we had left behind these steep walls with conifers and scattered rhododendron, wild cherry, birch, and hazel were delightful. From Cheto one looked eastwards to the glaciers of the Tatsienlu peaks; to the south-west one could see the Pilgrims' route that encircles the Konka massif. Two days later we continued westwards to the Cheto pass (Gi La). Long before we reached it, at 14,360 feet, trees and shrubs had been left behind, and the track wound up a stony, barren waste to the deserted cirques where now a little winter snow may sometimes linger. From the pass one looks eastward to the snowy peaks of the Ta Hsüeh Shan; but westwards, 1500 feet below, commences the great rolling plateau of Kham, home of the Tibetan nomads with their millions of yak. On the western horizon the irregular summits of the Sourang range showed where Paan (Batang) lay. The summer before, the west-facing slopes below Cheto had been glorious with alpine flowers; now, after throwing the customary stones on to the labcha at the head of the pass, we descended to Tiju over unlovely turf, hummocky and split by frost.

By the side of the track a heap of stones reminded one of the rest-houses that once were placed along this Imperial highway, but that have not been able to withstand the Revolution, Tibetan uprisings, and the passage of the Communists. At sunset we reached Tiju, a simple inn set in a deep flat-floored valley where azaleas in bloom broke the monotony of the endless grass. We had intended spending the night at the inn, but it was so indescribably filthy—pitch dark inside and full of yak-dung smoke from the fire—that we both decided a night under the stars was preferable. So we fixed ourselves up in the courtyard, just out of reach of the dogs on the one side and the yaks' tongues on the other, for many cattle were herded for the night. Fortunately the temperature did not fall more than half a dozen degrees below freezing. Captain Gill, passing through, thus describes the inn: "Here we halted for breakfast, but it was such a miserable place that we at once passed a unanimous vote for a picnic." [1]

After investigating the local hanging valleys we returned rapidly to Tatsienlu, where I was sorry to take leave of my companion, who was obliged hurriedly to return to the coast. I was most fortunate however in joining forces with Floyd Johnson, who also wished to see something of the plateau. It took nearly three weeks to get sufficient horses and mules to take us and our food. Indeed one wondered, with such an apparent plethora of animals, if the

[1] W. Gill, 'The river of golden sand,' p. 195. (London, 1880.)

Tatsienlu authorities were less favourable to travel in the interior than they smilingly would admit. Fortunately a Tibetan horse-owner owed Johnson a debt. If we used his animals the debt could be partly repaid, and so we were at last able to start. In addition to our tent we had brought provisions of rice, flour, and potatoes for a couple of months. In the larger settlements yak tongues, beef, and liver were often obtainable, but to get mutton it was apparently necessary to purchase the whole animal. Yak butter was easy to get, but it was rarely fresh and of the hirsute variety. Yak milk was available, but at times was difficult to obtain since some of the nomads believed that their animals would become diseased if their milk were given to foreigners. Where Chinese influence was marked chicken and eggs were to be had, but the eggs varied in price and quality, and would frequently rattle when shaken. Potatoes were sometimes obtainable, and we were able to lay in a good stock of imported sugar and peanuts at Lihwa. For cooking a pressure-cooker is essential, unless you wish to wait four hours for a stew and as many for a bowl of rice. There is plenty of fuel in the deep gorges, but on the plateau there is only dried yak dung.

Chinese currency is valueless except at the few post-offices maintained by the Chinese, and purchase is by barter or the rupee, then worth about $6\frac{1}{2}d.$ As there is no coin of less value than the silver rupee, the Tibetan has no hesitation in cutting one in halves. For the foreigner not out to barter, the marketing question resolves itself into how much can be bought for a rupee, rather than into how much must be given for a certain amount.

Once the stone bridge above Tatsienlu was crossed we were in territory where Chinese are few and where the nomad and lama are almost the sole folk met with; ethnologically the boundary with Tibet is the Tung river. Camp was pitched at Cheto: the night was perfect, with the Tatsienlu peaks showing faintly in the light of an early moon. From Cheto we again reached Tiju, where we camped for the night, and so continued for two days to a camping-place not far below the summit of the Kaji La, *via* Nawashi, Yingkwanchai and Tongolo, and past scattered Tibetan dwellings and fewer trees, wild gooseberry bushes and startled marmots, solitary chörten and despoiled dumps of auriferous gravels. From the Kaji La (14,890 feet) there should be a magnificent panorama, to the north-east and south-east, of snowy peaks from Jara to Minya Konka; but clouds hid the horizon, and shortly afterwards it began to snow. As it did so a Tibetan rode towards us over the pass, with rifle and mail-bag, singing gaily. His song had the wide, leaping intervals characteristic of Tibetan melody, in which, although a diatonic flavour is apparent, the final note, prolonged for several seconds, seems quite unrelated in key.

Beyond the pass the route led into a deeply incised valley, first through a rhododendron zone and, lower down, into magnificent spruce forest with lovely cones of maroon or mist-veiled indigo. Where fire had destroyed the spruce birch tended to replace it. Lower down came sycamores and ilex. At 12,140 feet patches of cultivation were seen, with barley, oats, and potatoes. Wild roses were common and tiny orchids abounded. After camping for the night we continued downstream; the valley walls, still very steep, were now bare and dry, with coarse grass and low, sparse bushes. These conditions

Tatsienlu

Loading yaks with tea at Tatsienlu

Tibetan house and defence tower near Yakiang

Disembarking on the west bank of the Yülung at Yakiang

extended to the junction with the great Yülung river at Yakiang (Hokow or Nyagika). In parenthesis it may be mentioned that the above vegetation zones are characteristic of all the deep valleys I traversed.

Yakiang clings to a ledge on the rocky walls of the Yülung gorge, almost slipping into the turbulent waters. Here we pitched our tent on a pebble-and-boulder beach, and spent a good deal of the night trying to keep it up in a fierce wind that rushed through the canyon. The next morning men, baggage, horses, and mules crossed the Yülung, a passage that has its risks, since a few days later this very boat sank in the rapids, all but two being drowned. We were now accompanied by two Tibetan guards armed against robbers, who are quite common in Kham. They wanted, once we were well away from Yakiang, to have the whole of their fee immediately. This was rather awkward, since we did not know how far they were to be trusted. Boldly we advanced a portion only, and there was no more trouble.

The route led up a forested valley where we camped for the night; the upper part of the valley was almost wholly in grass: we had again reached the plateau. We crossed the Rama La (14,920 feet), and after many miles of rolling upland again descended to Singolo, a tiny hamlet in a broad, flat-floored valley. The next morning it was necessary to exchange our guards for others from the local Tibetan chieftain, or *Tu Se*.

His fortress was impressive: a great three-storied building of stone and wood, with minute windows, and flanked by numerous chörten. Entering the gate we first crossed an untidy courtyard wild with murderous Tibetan dogs which, like their Mongolian brethren, will tear your throat out if you venture on their master's premises, and yet will slink away with tails between their legs when met with in the street. Passing in darkness through the stables we climbed rough stairs to the granary, and then up further steps to a narrow landing overlooking a square central space open to the sky. We were ushered into a great hall whose roof was supported by immense pillars of spruce. Here it was very dark, smoke-filled, and lit by the flames from a great stove set against the outer wall. On the wooden partition wall rude figures were carved and painted, chörten, swastikas, etc. Along the walls a continuous bench was placed, roughly upholstered, whilst before it was an equally long and narrow table in which, at intervals, were depressions containing shallow pans with charcoal fires used for keeping the tea hot. The tea itself was prepared at the great stove, opposite which was a second one, equally big but not then in use. On the low table were numerous piles of tsamba and butter for guests and inmates of the fortress. The *Tu Se* greeted us and showed us to the long seat. He was a tall, striking man, rather handsome and with long uncombed hair, dressed in a bluish-purple Tibetan cloak, high Tibetan boots, and girdled by a belt from which the inevitable knife and tinder-pouch were hanging. He wore immense rings on his fingers with stones of red coral and pale blue turquoise; from his ears hung others equally big.

We were offered buttered tea and tsamba, and in our turn offered a cloth-bound book, printed in Tibetan at Shanghai, and with endless illustrations, many in colour. With this he was obviously delighted. A few moments later we were groping our way through the smoke, past glimmering ladles of brass

that hung in great numbers on the wall, and so into the brilliance of the morning sunshine. The chief accompanied us to the very gate, smiling and indicating a stalwart guard of three.

The normal route to Lihwa (Litang) was dangerous on account of the banditry for which Kham is famed. We took a slightly longer way and after two days' travel over the grasslands reached one of the highest settlements in the world, and pitched camp near the yamen at 13,440 feet above sea-level. Lihwa lies on a sandstone spur above an elongated plain several kilometres broad, on the opposite side of which rise low granite mountains once glaciated. The essential Lihwa is the lamasery with its 3700 lamas and drabas. The town consists of a single line of hovels stretching down the spur and sheltering some 750 inhabitants. Below the town lie the ruins of a great fortress that belonged to the princes of Litang. A more unpleasant locality for a settlement would be hard to find, with the treeless, often bare, landscape, the amazingly rapid temperature changes, the high winds and dust, the frequent lashing hail in summer and the exacerbating effects of high altitude. The inhabitants throw their refuse out of the back door so that the town is almost completely surrounded by garbage dumps, which the 24th Army was endeavouring to beautify by constructing walks and pleasances upon them. This part of Tibet is nominally under Chinese control, and the town has a Chinese garrison and magistrate. But control is not easy, and a state of compromise actually exists. For this reason we found it most difficult to get northwards from Lihwa, the magistrate doing his best to persuade us to return to Tatsienlu. Two powerful *Tu Se* held sway between Lihwa and Chantui (Chanhoa); if a Chinese guard were sent with us we should all certainly be robbed and probably lose our lives. He pointed out that a Chinese magistrate was forced to make friends with the strongest of the local *Tu Se* and so enjoyed very strictly limited power. Even the Reincarnation at the Lamasery could give no guarantee of safe passage. Neither of us carried any firearms whatsoever, and the only solution was to get into touch with the *Tu Se* and arrange to pay them tribute, if they would take it, in return for safe convoy. This caused much delay but gave us time to see the town and locality.

The lamasery, built of wood and stone with cupolas of gold, and with its weather-beaten prayer-flags, dingy halls of worship with faded images and banners, prayer-wheels, its all-pervading odour of rancid butter, and its inmates themselves in their filthy red robes, certainly enthralls the imagination. Although hated by the valley farmers and nomads the lamas control Tibet, and they are so suspicious of foreigners, and so conservative, that the smallest degree of modernization would seem impossible. Early in the day they pray and meditate; afterwards they stroll about in little groups, buying and selling horses, or doing other trading.

Fortunately we were invited to meet the head Lama, known to the western world as a Living Buddha. Crossing the courtyard, we were shown up a rough and rickety stairway with a loose yak-hair rope for banisters, and so along a dark passage-way into a gloomy chamber. We could make out the form of a Tibetan rising to greet us, and were motioned to sit on his left hand on a fine leopard skin spread on a long low seat with table and small brasier before it. We were offered aromatic tea in porcelain cups set on attractive

metal stands, fruit, and candied sugar. The Lama was a tall handsome man, some twenty-five years old, and sat with his back to a tiny window cross-legged on a pile of cushions. On the table before him juniper incense rose from a small censer set amid a clutter of books and writing materials. On the opposite side of the room a species of sideboard supported a central Laughing Buddha and a host of smaller effigies. On our host's left hand were more figures, two old-fashioned western clocks with glass sides, and six electric torches. On one wall hung numerous photographs of officials and lama dignitaries, and two large Chinese posters, one of Sun Yat-Sen, the other of Chiang Kai-Shek. Tibetan knives, a belt, and riding whips hung from a central wooden pillar. Lastly, in front of the small window facing us an inquisitive crowd of dim, peering forms were observing us. Our headman spoke to the Lama in Tibetan and translated his replies into Chinese; but both of us had the impression that the Lama could speak Chinese himself. He apologized for not inviting us to eat with him on the grounds that we should find the food unpalatable, but made us a present of sugar and dried jujubes, promising to send milk and eggs in the morning. He was then presented with illustrated books, and graciously gave us permission to photograph him. This was done the following morning; the courtyard having been emptied of the curious, a fine rug was spread there, with seat and leopard skin, and the Lama descended.

The local Chinese garrison was commanded by a very charming officer. We noted that, at a feast offered us at the yamen, he refused meat and wine. In the lamasery he had filled a whole chapel with lamps—wicks floating in melted yak butter—and symbolic mounds of buttered tsamba. At his quarters figures of Buddha hardly left room for a bowl of tea. Such extreme piety seemed to demand an explanation. Actually, he was making his position safer with the Lama by showing the religious excellences of which he was capable; he had certainly not forgotten that a large detachment of Chinese soldiers was then on its way to Lihwa. The arrival of these soldiers the night before we left was followed by fighting between the Tibetans and Chinese.

From Lihwa our route led northwards; following our Tibetan guards we travelled over the grasslands, now in a deep valley where gold-washing was in progress, now over a high pass. The first *Tu Se* to whom tribute was due lived in a small settlement not far from the head of a deeply incised tributary of the Yülung. He was the proud possessor of a western bed, a witness to the wrecked and plundered missionary hospital at Paan. He was most anxious that his photograph be taken, seated on his bed and surrounded by specimens of Victorian cheap glassware and pottery. Guards were exchanged and we set off in the morning down the same valley, thick with spruce and gay with wild flowers. A few strips of cultivation were seen, with barley growing, at 12,570 feet. That evening, after passing an enormous manidrombo, at least some 300 yards long, we reached Hsü Hsi Sung Tu, with its large fortress. After a vicious downpour of hail we camped, and were visited by the local *Tu Se*. He was a saturnine individual who, sitting gravely in our tent, suddenly produced an alarm clock from his gown. This looked like a feat of prestidigitation, to impress us; actually, the

alarm refused to function. My companion soon fixed it. Without uttering a word in reply the *Tu Se* produced just as suddenly a small musical-box, which also refused to perform. This was more of a problem to mend, but in twenty minutes we heard a crystal tinkling, and a charming Gallic melody filled the tent. To this *Tu Se* the second lot of tribute money was due, and we visited him at the fortress the next morning. A large and highly ornamental oriental clock boldly faced us as we entered the private apartments, a sight that made my companion blench slightly, but fortunately it was only there to be admired.

Later we reached the Yülung again, true daughter of the turbid Yangtze, and here incised many thousands of feet. A few miles farther up it was to be crossed by yak-skin coracle. The horses had to swim, being pelted with stones until they did, whilst we swept downstream at a good 20 miles an hour to Ma Hsü. The next morning we passed up the steepest tributary we had yet encountered and soon struck woodland, gay with wild roses, elderberry, wild cherry, and countless varieties of wild flowers. At the head of this long pull we passed through a forest of matted and tangled ilex from whose branches hung masses of grey-green moss. At last the grasslands were again reached, but not without the loss of our white horse, henceforward incapable of bearing a load. That night we camped at 14,980 feet; in a valley far below us great herds of yak pasturing looked like a battalion of strange beetles.

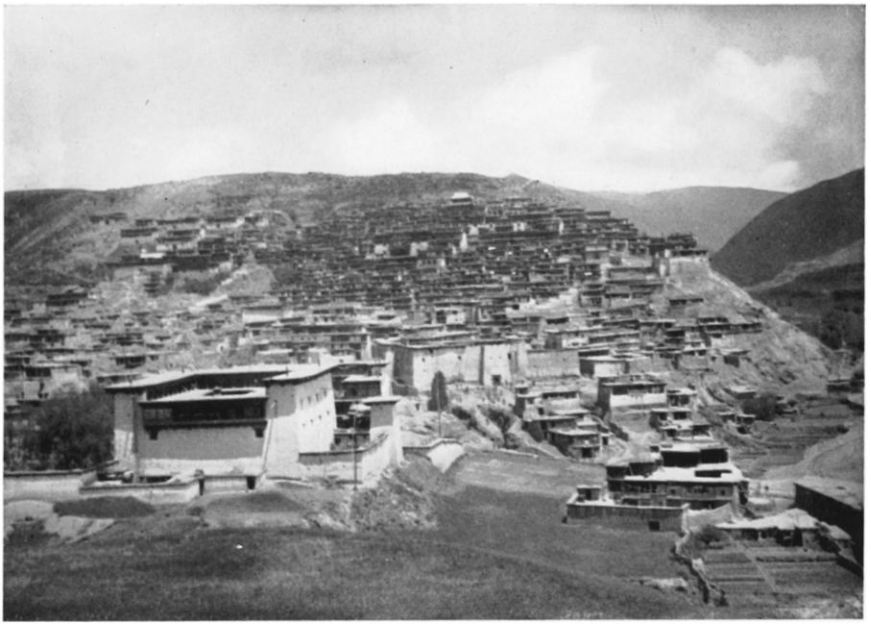
The next afternoon we crossed the Sara La (16,100 feet). Our men were on their knees and, we thought, praying to the deities of the mountain; actually they were gathering wild onions that abounded there. Glorious yellow *Meconopsis* grew too about these once glaciated highlands. After a short but lashing downpour of hail we entered a further deeply incised tributary of the Yülung, and camped shortly after the spruce belt had been entered. The hail and thunderstorms we encountered during the whole journey were many. At Lihwa the wind one night of storm had been so great that our tent, in spite of all our efforts, had been blown over our heads.

Crossing a Tibetan cantilever bridge over the Yülung, the next afternoon, we reached Chantui (Chanhwa), and camped under the ruins of the great fortress. After lunching with the magistrate we watched Tibetan women dancing. The dancers formed two semicircles each moving independently in a ring, so that one semicircle would pass the other at intervals. As they moved they made intricate foot and arm movements, waving ceremonial *katas* (silk strips), but never making abrupt movements. They sang a song with a great number of verses with a strongly modal flavour. The wide intervals were not so marked, but the long pauses on final notes were again characteristic.

Our route now led up the Yülung itself. The strain of the journey was beginning to tell on the mules, and we applied for *ula*. This system of animal hire, instituted in Tibet in Imperial times, was originally intended for officials. Now it has fallen into abuse and its granting depends on the whim of the local authorities. The original idea was that the Tibetans should supply animals and, in return, a small sum of money was given them, although the greater part of the fee took the form of a remission of part of the taxes. At first this system caused us much delay; at the end of each stage, sometimes only a few

Jara

The Yülung gorge below Ma Hsü



The lamasery at Kantse

Tibetans in the main street of Lihwa

miles, the ula-owner would be away, or would have to chase after his animals, or even we should have to be content with riding yaks, with a single rope through their noses as a rein. At times there were no animals available and we had to wait till there were (no one was willing to lose a chance of tax remission), and the discussions hindered and irritated us. On the third day things improved and we had not to change more than twice a day.

Very striking high-level erosion terraces are to be seen in this part of the Yülung as well as low-level aggradational terraces. At Cha Na the Tibetans sought to prevent us from camping at what seemed an excellent spot, saying that an evil spirit lived there: when the tent pegs were driven in he would awake and we should be stricken with illness. Actually the place was very marshy and not unlikely to give rheumatism to those who stayed long.

At Takai there is a large lamasery. Here we found it much cooler, being not so far from the beautiful snow-clad summit of Ka Wa Lu Jih and its attendant peaks. Highly religious lamas are able to observe a black lion that at times chases around the peak. Two days later we reached Kantse. The Yülung gorge had been left at noon, and the route led across a level plain, rather broad, with the braided Yülung clinging to the southern edge. In the distance to the south-west were snow-clad limestone mountains. Camp was pitched at 11,430 feet in a little grove below the lamasery. Here there are some two thousand lamas and drabas, but in spite of the outwardly attractive appearance of the lamasery, with its flat roofs so reminiscent of Algiers, and its golden spires, the interior is extremely shabby and dirty. The place is a gigantic rabbit-warren of filthy, muddy passage-ways, dog haunted, off which small doors lead into the lamas' quarters. In a small courtyard a couple of lamas were practising some steps for the devil-dances; Tibetan women were bearing great wooden pitchers of water; tattered and discoloured prayer-flags hung in a motionless air. The town is fairly clean since the Chinese have brought their New Life Movement here. There are some fifty or sixty Chinese families and some four hundred and forty-five Tibetan ones. The magistrate invited us to an *al fresco* luncheon in our little grove, although it is most unusual for the Chinese to eat in the open, especially at a feast.

After a few days at Kantse we left for Taofu. At first the route led eastwards across the treeless plain where thousands of little tailless rats scampered before our mules and where peonies were numerous. In a deluge of rain and sleet we crossed the Lukwo Liangtze pass and so down towards Ka Sha lamasery, wall-girt, beside a little lake. Here cultivation started, and there were fields of barley, peas, and mustard for oil. After camping at Chuwo we followed the Lu river downstream for three days. This is gorge-like only in sections, and bears no resemblance to the great Yülung. A twelve and a half hours' stage was made to Luhwo, where a great lamasery lies 1000 feet above the river. The chief lama there is a man of progressive tendencies and, according to local talk, would like to leave his position and take up a western type of life. The Chinese are restraining him owing to his political and administrative capabilities. Some way below Luhwo the valley broadens out and the river flows in a braided course. From here as far as the Taofu region, and even to Taining, striking earthquake rents are seen everywhere, memorials

of the great quake of 1918 and of the even more disastrous one in 1923. A further point of interest is that here, as well as at Kantse, loess is much in evidence, at times *in situ* but more often rewashed, or otherwise *remanié*. Calcareous concretions were found in the loess at Kantse.

Again the valley narrowed to a gorge and once more widening somewhat led to Taofu, 10,200 feet above the sea. Here we were the guests of Father Doublet, who for years has been in charge of this outpost of the Catholic Church. The passage of the Communists had scourged the country; thousands of Tibetans, tribespeople, and Chinese had been butchered; settlements were burnt and all food eaten. Naturally, there were no crops in 1936 and famine was rampant. In the tribal areas of Hsiu Chin, Tanpa, and Mongkong conditions forced the natives to cannibalism.

From Taofu to Taining is normally two stages, but it was not possible to stay the night at Kwan Chai Tzu owing to the bandits which then infested that halfway halt. We therefore did an easy stage the first day and a gruelling one the second. Until 9 a.m. on the second day, when the Sunglingkow pass was crossed at 13,280 feet, we ascended a wooded valley. Spruce and scrub ilex were common, and wild roses, strawberries, and wild currant bushes gave variety. It is worth mentioning that the present topography, in the region traversed, makes for the greatest contrasts in insolation, exposure to wind, duration of snow-cover, amount of precipitation, rapidity of run-off, etc., in areas separated from each other often by a few tens of metres. These contrasts are clearly marked in the vegetation: one side of a valley, usually that facing north, will be clad with magnificent conifers; at the same elevation, but on the opposite side, there will probably be but scattered ilex. But let the valley change, even temporarily, its direction, and the vegetation types reverse sides.

On the second day after leaving Taofu the watershed between the Tung and Yülung rivers was crossed, an area with great earthquake cracks, and Taining was reached. Shortly before reaching this settlement a magnificent evening view of the Minya Konka complex was enjoyed, the great mountain rising on the south-eastern horizon, whilst right ahead of us, very near, was the snowy glory of Jara. Well before noon the next day a pass of no great height was crossed and, after much delay, for the Tibetans had let the horses stray out of sight during the lunch halt, we reached a well-incised valley, timbered with conifers, birch, and ilex, and flowing from the direction of Jara. Further up this valley a perfect terminal moraine was examined at a height of 12,430 feet. High up numerous small corries were seen. Both features belong to a past glaciation, and the whole question of Pleistocene glaciation will be treated in a separate paper. Camp was pitched only a few kilometres from Jara, in a little wood and, the next morning, after investigating the local moraines, the steepish ascent was made to the Haitzu pass at 14,038 feet, beside Jara itself. On our right was an enormous morainic bank sheltering a small but beautiful bluish-green lake fed by a waterfall from the melting ice above. The route led past the mound, and after a stiff climb one reached an upland whose level nature was disturbed by the great morainic piles strewn about. All around were bare, glacially dissected summits, but snow and ice were observed on Jara alone. On the flattish upland two further

lakes were passed and, once over the Haitzu, through a zone of sparse azaleas and rhododendrons, the route led into a remarkably rectilinear valley, once glaciated. From there, past the hot springs of Chungku and Erh Tao Chiao, it took not much more than a day's travel to reach Tatsienlu once more. The first signs of cultivation were at Chungku, at 10,600 feet. At Erh Tao Chiao (*c.* 8000 feet) cultivation was varied; its crops can include wheat, barley, oats, cabbage, beans, peas, carrots, turnips, celery, even maize, buckwheat, and potatoes. Here moreover, on account of the sulphurous hot springs, the inhabitants of Tatsienlu have constructed a rough road to the hamlet, making it into a small spa. All day long the good folk of Tatsienlu were coming and going, the majority on foot, the wealthy in one of those three or four rickshaws so very recently arrived and still the wonder of the town, this little strip of road being the only place for miles where a rickshaw could travel.

Note on the sketch-map, p. 358.

The author's route as shown in the sketch-map is based on the work of H. C. Tan and C. Y. Lee, with additions, including heights, by the author. The rest of the map follows the New China Atlas, 1936.

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KARAKORAM, 1939

ERIC SHIPTON

Meeting of the Society, 4 March 1940

THE Shaksgam Expedition of 1937 fulfilled its objects in the fixing and detailed mapping of the country surrounding the Aghil pass and the great glacier system lying immediately to the north of the main Karakoram watershed, between K^2 and the Shimshal pass. There still remained much of the Aghil range to be explored, as well as the mountains stretching to the north-east of the Shimshal pass across the Oprang river, before the map of the main features of the Greater Karakoram could be completed. From the experience I had gained in 1937 it was clear to me that the task would probably best be tackled during the winter, when the rivers, instead of presenting the traveller with impossible barriers, might even be used as high roads by which to penetrate to the heart of the unexplored regions. I mentioned my plans to the Surveyor-General of India on my way through Calcutta to Mount Everest in 1938, and he replied that he was anxious to straighten out the topographical confusion which existed in that part of the main range surrounding the basins of the Hispar, Biafo, and Panmah glaciers. It was obvious that this task could easily be combined with my winter plans, and I submitted detailed proposals to the Surveyor-General, who at once offered me considerable support and encouragement. I therefore decided upon an expedition covering some sixteen months, which was to be divided into four parts. The summer of 1939 was to be spent in the Hispar–Biafo–Panmah area; the winter of 1939–40 was to be spent in the country east of the Shimshal pass; during the spring of 1940 a journey was to be attempted from Shimshal to Leh *via* the Shaksgam river, during which it was hoped to survey that part of the Aghil range lying to the north of the country explored by Mason in 1926; plans for the summer of 1940 were undecided pending political permission to enter certain areas far removed from the Karakoram range.

I asked Mr. Scott Russell to accompany the expedition to assist in the exploration work, to make detailed botanical collections and surveys, and to continue some important physiological researches which he had been making

into the effect of cold climates upon plant growth. Dr. E. C. Fountaine was invited to come as medical officer, to help in the exploratory work, to make zoological collections, and to study certain medical and ethnological aspects of the people of Shimshal. At first I expected to have once more the invaluable assistance of Mr. Michael Spender as surveyor, but at the last moment he found it impossible to come. At very short notice Mr. Peter Mott stepped into the breach and undertook the work of chief surveyor. The Surveyor-General lent the expedition the services of two Indian surveyors: Fazal Ellahi, who had already made a considerable reputation by his mountain surveys and his resource in difficult circumstances; and Inayat Khan, a younger man, but experienced in the type of work to be undertaken. Later Messrs. Campbell Secord and A. F. Betterton joined the party for a short period.

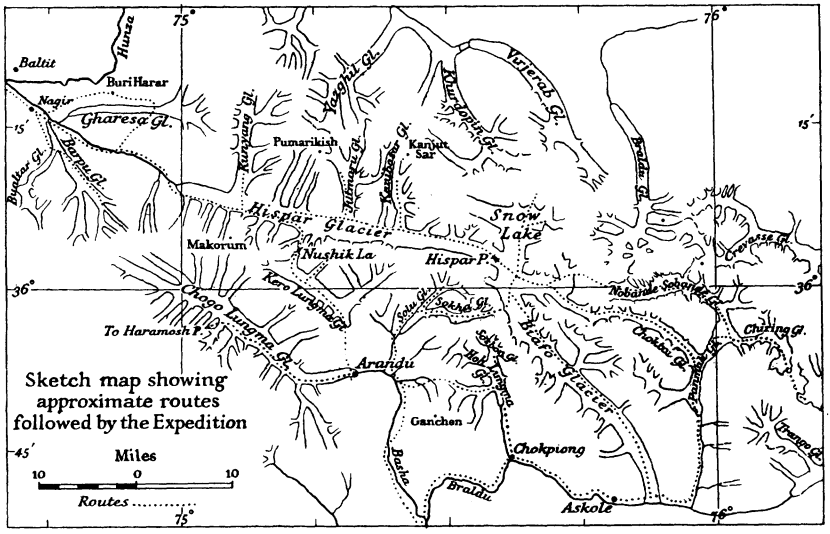
The expedition was financed by grants of money from the Royal Geographical Society, the Survey of India, the Royal Society, the Percy Sladen Fund, the British Museum (Natural History), and the Royal Botanic Gardens, Kew. Mr. R. W. Lloyd and Mr. A. Courtauld also most kindly contributed towards the funds of the expedition. Apart from the length of time it was intended to remain in the field, the estimated cost of the expedition had to be greatly increased by the necessity of providing special winter equipment for the party. Nine Sherpa porters, under my old friend Angtharkay, were engaged from Darjeeling.

Michael Spender, in a report written for the Survey of India upon the position of the Biafo watershed, said: "As compared with the rest of the Karakoram range the Hispar–Biafo glacier system may be considered easily accessible to travellers. Yet any discussion of this region is confused by the unreliability of the surveys not only of these two glaciers but also of the neighbouring systems: the Panmah, Hoh Lungma, Kushuchun Lungma, Khurdopin, and Virjerab basins. These surveys were not even properly based on such G.T.S. points as were available." This shows clearly the state of the topographical confusion in this area, and our task during the summer of 1939 was to fix as accurately as possible the major features of the region and to make a detailed map of the Hispar, Biafo, and Panmah glacier basins. We had with us a Wild universal theodolite belonging to the Survey of India, the Wild plane-table outfit of the Royal Geographical Society, a new phototheodolite hired from Zeiss, and two Survey of India plane-table outfits. For time signals we took a three-valve short-wave wireless set, weighing 30 lb. including batteries, designed by Mr. Matthews of the Royal Geographical Society. It gave perfect satisfaction.

My original plan was to take the whole party as soon as possible across the Hispar pass and to establish a base stocked for at least two months on the "Snow Lake," the basin of the Upper Biafo glacier. From this it was proposed to climb several high peaks which would command views of many G.T.S. points in widely separated areas. In this way, with the Wild theodolite it would have been possible to fix the positions of the peaks climbed and to intersect a large number of other peaks in the distance, thus forming a basis for the accurate mapping of the district. While the surveyors were at work parties would have had plenty of time to visit all the accessible cols in the

district and thus, by using the phototheodolite, to make actual connections with the country beyond the various surrounding watersheds, thereby fixing beyond dispute the relative positions of all the glacier systems in that part of the Karakoram. The original plan however was changed and it was decided instead to carry a triangulation from the Indo-Russian system in the Hunza valley up the Hispar glacier and over to the Biafo. This change proved to be a mistake, and I am further convinced in my belief that the most effective way of exploring and mapping a mountain area of this kind is from a base somewhere in the middle of the area.

The main party reached Nagir *via* the Kamri pass and Gilgit on July 3. On that day Mott and Fazal Ellahi ascended Zangia Harar, one of Mason's triangulation stations just below the junction of the Hispar with the Hunza



Karakoram Expedition, 1939

river, the former to start the triangulation, and the latter to start a plane-table survey of the large glacier system which lies south of Nagir. Russell went with them to start his botanical collecting. He and Mott did an astronomical fix on Zangia Harar and arrived at Nagir late on the evening of the 5th. The following day Russell, Secord, and Betterton went up the Barpu glacier system to collect plants and to look for a pass to the Chogo Lungma. Mott, Fountaine, and I set out to climb to Buri Harar, another of Mason's trig stations to the north, and with the object also of exploring the hitherto unvisited Gharesa glacier. We reached Buri Harar on the morning of July 8 and found its position to be totally unsuitable for our purpose. It is on an inconspicuous spur of the main ridge and, though it commands a fine view down the Hunza valley, for which it was intended, we could see nothing of the country towards the Hispar. We moved our camp and after two days reached a prominent point farther along the main ridge to the south. But from there, although we had built a large cairn on Buri Harar, we could not

identify it with sufficient certainty through the theodolite telescope amid the profusion of ridges and gulleys of that vast landscape. All this wasted a great deal of time which was further prolonged by the necessity of selecting and laying out a new base in very difficult country. The two weeks originally allowed for the triangulation seemed likely to be protracted into months. Mott and I returned to Nagir on July 10 while Fountaine went up the Gharesa glacier. Accompanied by Secord we went up the Barpu glacier on the 11th, and on a long ridge dividing the Barpu from the Hispar valley a base about $1\frac{1}{2}$ miles long was measured, which could be connected indirectly to Zangia Harar. This work took two days owing to the difficulties of travelling and setting up stations on the ridge. Further astronomical observations were made for latitude and longitude. I also went up to the head of the Barpu glacier to Fazal Ellahi, who was working there at that time. He had already completed about half the area and had fixed the peaks of the main watershed, which is much farther south than indicated on the existing maps.

The Barpu glacier is very delightful. Along its right bank, almost to the head, there extends a wide ablation valley filled with willows and rose thickets and wild flowers. The roses were then in full bloom and for miles great banks of their gay blossom seemed to fill the valley. Well over half-way up the glacier, in the ablation valley, there is a small village with some cultivation. The head of the glacier is shut in by a great wall of ice-covered mountains, which offer little chance of a pass to the south. There is however an easy route to the nullah which descends to Hispar village. The other big glacier of this region is the Baltar, which stretches right down to the Hispar river and is flanked in its lower reaches by a large area of rich cultivation known as Hopar. Half-way up this glacier a great stone avalanche, continuing to fall for several days, filled the air around with a thick dust haze which hampered survey operations. The Barpu glacier now falls short of the Baltar, which has retreated enormously within the memory of the present Mir of Nagir.

Fountaine returned to Nagir on July 16, after having made a thorough exploration of the Gharesa glacier. He had found that it rose from a range of high peaks, several of which were over 24,000 feet, and is fed by a number of sources. It had evidently retreated much in recent years and several masses of dead ice were found some miles below the present snout. Fountaine found no pass from it towards the glaciers of Shimshal. On July 16 Russell and Betterton started with sixty coolies to lay a dump up the Hispar glacier and to attempt to cross the Nushik La from the Hispar to Arandu in Baltistan. This pass had only once before been crossed by Europeans (Bruce and Eckenstein, members of Conway's expedition in 1892) though it had been several times attempted before and since. The last recorded attempt was by the Workmans, who reported it to be inaccessible from the northern side. Two days later Fountaine and Secord followed Russell's party, and after careful reconnaissance and a good deal of difficulty the two parties together succeeded in effecting a crossing of the pass. The local men would have nothing to do with it, but the Sherpas and the Europeans were able to carry all their loads without help. Russell and Betterton went down to Arandu, and from there Betterton returned *via* Skardu to Srinagar. While Russell was collecting in

the valleys to the south of the Nushik La, Fountaine and Secord did some photo-stations above the glaciers of the Kero Lungma, and also reached another high col in the South Hispar Wall from which they could not descend to the north.

Meanwhile Mott was continuing his triangulation and I remained in Nagir to assist him. On July 21 we moved up to Hispar, and while he was working in that area Angtharkay and I took thirty coolies up the Hispar glacier to lay a dump of food at Kanibasar just below the Hispar pass. I found the Nagir coolies difficult to handle, and in spite of good weather and conditions they were continually making trouble. However the dump was laid and I discharged the coolies and returned down the glacier to await the arrival of the others. The whole party, including Fazal Ellahi, reunited at Makorum (two marches up the Hispar glacier) on July 31. During July Inayat Khan had not been fit, and I decided to leave him for the whole season to work in the less severe country surrounding Nagir and Hispar and the first 10 miles of the Hispar glacier. Fazal Ellahi, using the newly triangulated points, now started his survey. For the next ten days or so the triangulation was carried slowly up the Hispar glacier and Russell was busy with his physiological work, some of which had to be done during the night. Fountaine and Secord went up the Kunyang glacier. They crossed a high pass which led from a tributary to the head of the main glacier. They attempted to reach a high saddle at the head of the latter, which would probably have led them over to the Yazghil glacier, but the danger from ice avalanches rendered the route to it too hazardous, and they abandoned the attempt. They joined the main party on the Hispar on August 7.

I had hoped to have the help of Nagiri coolies in carrying supplies across the Hispar pass and to keep a few of them while we were there. But except for one man they refused to go farther than Kanibasar. They gave various reasons for their refusal, but I am satisfied that the real reason was that nowadays they are frightened of venturing on the upper part of a glacier. We had equipped them with boots, sleeping bags, and tents. The task of carrying all the loads fell upon the Sherpas and ourselves, beside the one Nagir coolie who remained with the party throughout the summer. On August 12 a relay of loads was taken to the top of the Hispar pass, and on the 13th we all occupied a camp there. Two days were spent on top of the pass, during which Mott, Fountaine, and I occupied several high triangulation stations. Fazal Ellahi made use of some of the stations for his plane-table survey, and Russell and Secord ascended the peak on the Biafo–Hispar watershed north of the Hispar pass that had been climbed by the Workmans in 1908. There is no doubt whatever that it was the same peak. We had with us several photographs of it taken by the Workmans from near the Hispar pass. But whereas they estimated the height at 21,300 feet, both our triangulated height for it and Fazal Ellahi's height worked out at 19,400 feet. The weather was perfect and we all got very extensive views from our various stations, reaching as far as Haramosh and K^2. Russell and Secord spent four hours on top of the watershed peak taking photographs, rays, and vertical angles to all the points of interest with the Wild plane-table outfit. The height for the Hispar pass worked out at 16,910 feet, and our fixing placed it 7 miles to the west of

its position on the old map. This shortens the length of the Hispar glacier to 30 miles.

On August 15 we descended to the Snow Lake. The failure of the Nagir coolies had forced us to abandon much of our fuel supply on the Hispar glacier. This necessitated a radical alteration of the original plan and the postponement of several projects in the vicinity of the Snow Lake. We spent four days working there, during which time Fazal Ellahi got well started with the survey of the Biafo. At this time of year the upper glacier consisted mostly of dry ice and was perfectly safe to move about on, so on August 19 we left Fazal Ellahi with all the available food and fuel, four porters and his personal servant, to continue his work. Fountaine, Secord, and I descended the Biafo glacier in three days to Askole, while Mott and Russell crossed the pass discovered by Tilman in 1937 to the Cornice glacier. Travel on the Biafo glacier is remarkably easy, as the smooth white ice extends from its upper reaches almost to the snout. Except for camping, we made no use of the extensive ablation valleys which stretch for 20 miles up the glacier and are well filled with grass and fuel. In these ablation valleys were many bear tracks, though we never saw any of the creatures themselves. At Askole, Secord left us to return to Srinagar, and Fountaine and I started with three weeks' food for the Panmah glacier. I was pleased to find that our dealings with the men of Askole in 1937 had left them with confidence and an apparent affection for us, and there was considerable competition among them to accompany us, which was a welcome change after our recent experience with the Nagiris.

The lower Panmah is typical of most of the valleys of the district. It is desolate and barren, and its bed is filled with gravel and mud deposits, with large alluvial fans split up by the present streams into high cliffs and deep gorges. Typical also are the frequent oases: grassy glades, willow and rose thickets irrigated by spring water. The largest of these is the grazing ground of Panmah, which is about 12 miles up the valley, at the snout of the glacier.

We had with us the Zeiss phototheodolite, and began the survey of the Panmah glacier system with a high station west of Panmah on August 25. Meanwhile the porters moved our camp a few miles up the glacier to the foot of our second station, which we occupied the next day. The weather then broke. We moved our camp across the main glacier to a point opposite the junction of the Choktoi glacier. We were confined to this camp for three days. Angtharkay shot several ibex, which kept us well supplied with meat for the next fortnight or three weeks. On the 30th the weather cleared, and on that day we did a station about 2500 feet above the camp and moved up towards Skinmang at the junction of the Chiring with the main glacier. On August 31 Fountaine, with two Sherpas, went up the Chiring glacier and camped at about 17,000 feet. The next morning he continued up the glacier and soon saw a low col beneath a spur of the mountain that we had identified as Spender's Changtok Peak, which would obviously have led to the north branch of the Sarpo Laggo glacier. Since the view from the col was likely to be limited, he decided to continue up the glacier to a high col 2 miles to the south, the summit of which he reached without difficulty. The descent down the other side to the Sarpo Laggo glacier was no more difficult. The view to

the east included Skyang Kangri (Staircase), K^2, Broad Peak, and the Gasherbrum Peaks; to the west the "Ogre" group, Kanjut, and many other giants. The pass he was on (the long-sought "New Muztagh pass") affords a very easy means of communication across the main Asiatic watershed; certainly the quickest and easiest known route between Askole and the Shaksgam river. On the following day Fountaine climbed to the head of another branch of the upper Chiring glacier and reached a col leading to a tributary of the Panmah glacier. From the head of this however there seemed to be a practicable route to the Trango glacier. Compass bearings and photographs from both these cols will be a great help in drawing the map.

Meanwhile on August 31 I climbed a peak some miles up the Chiring glacier on its northern side. The peak was about 19,600 feet high and commanded a magnificent view of the whole district while providing me with an admirable survey station. On September 1 I climbed another small peak above the Drenmang glacier for the same purpose, and saw far up the Nobande Sobande glacier. It is difficult to know why this glacier is so named, for it is really a continuation of the Panmah. Nor did the name convey anything to the local men. I found many bear tracks along the side of the glacier up as far as the Drenmang. Skinmang, where I had my camp, is a delightful spot flanked by gentle grass-covered slopes which stretch for many miles, and watered by clear streams. On September 2 I crossed the Panmah glacier again and fixed another station 2000 feet above its western bank. Fountaine joined me that evening after three days of strenuous mountaineering.

We then moved down the main glacier, surveying on the way, and camped on the 3rd on the right bank of the Choktoi glacier. On the 4th we carried heavy loads 8 miles up the Choktoi, taking with us a large supply of juniper fuel. Travelling was easy, over smooth white ice. We now discharged the Balti coolies. When we entered the upper basin we were met by a stupendous view of the granite peaks of the Ogre group standing a sheer 7000 feet above the glacier. As we rounded the corner, one after another the ice spires crowning the knife-sharp ridges of the peaks flicked into view, brilliantly translucent in the afternoon sun. The walls flanking the right bank of the glacier were so steep and unbroken that we had great difficulty that evening in climbing to a point sufficiently high for a suitable station. The next day we climbed high above the opposite bank, and on the 6th we reached a small peak, about 18,500 feet, on the Nobande–Choktoi watershed. The weather was fine and our view extended far over the ranges to the north, while to the south the Ogre group showed its full magnificance. We moved to the head of the Choktoi, completed our survey of it, and moved camp to the crest of the col between the Choktoi and the Nobande Sobande, which had been crossed by Desio's party on the Duke of Spoleto's expedition in 1929. The col afforded an excellent position for a station. On September 9 I descended the Nobande Sobande with two Sherpas. An extremely steep ice-slope overhanging a bergschrund made it impossible to climb down in the ordinary way, and we and our loads were lowered by means of our combined supply of rope. Having acted as human belays, Fountaine and Lhakpa Tensing descended again to the Choktoi with the intention of attempting to cross a col to the Snow Lake. A deep gorge near the head of the Choktoi glacier, formed by

sheer granite cliffs, had prevented a satisfactory view of the col, but we knew that there was a deep depression in the watershed at that point. They camped in the gorge that night and early next morning continued through it. They found the topography to be most complicated. The gorge they were in proved to be a subsidiary passage which connected with a large alley leading from still higher up the main glacier, at a point just below an impossible ice-fall coming down from the col. They climbed on to a broad ice-shelf from which they were able to reach a steep ice-ridge flanking the upper part of the ice-fall. They succeeded in climbing this by cutting steps for about 500 feet, and so reached the col at 1.30 p.m. The weather which had broken during the night had not improved, and they were met at the top by a cold wind and drifting snow, which made photographs and compass bearings difficult. The descent to the Snow Lake was easy, and the following day they reached the food dump left by Fazal Ellahi.

Meanwhile on September 9 Angtharkay, Kusang, and I, having been lowered down on to the Nobande Sobande glacier, pitched camp just below the pass we had crossed. The same day we went some way down the glacier and climbed a steep ice-fall of a small tributary glacier flowing in from the north, which provided me with a suitable theodolite station. Again my view extended far across the main watershed to the peaks flanking the Shaksgam river. Our long period of fine weather broke and snow fell in the night. The next day, still carrying a large load of juniper wood collected near the foot of the Choktoi, we pushed on up the Nobande Sobande, making for an obvious gap at its head. Travel on this glacier was very easy; there was only one badly crevassed area, and that we had avoided by crossing from the Choktoi. We reached the col without difficulty, but were met on the top by a heavy wind blowing from the west. Sending the Sherpas on to find a route down the other side, I set up the theodolite in a small bergschrund which was sheltered from the wind. Though heavy clouds hung over the peaks and mist frequently obscured the whole scene, I was able to observe sufficient angles to fix my position and to take the necessary photographs. The descent on the west side of the col was difficult, but by lowering our loads from ledge to ledge down the steep ice-slope we were able to reach the glacier and camp there before dark. On September 11, in drifting cloud and snow, we crossed the Snow Lake and reached the dump at 4.30 p.m. Fountaine and Lhakpa Tensing were already there. There was also a note from Russell saying that he was on his way to our base on the Hispar glacier to fetch supplies. For the next two days bad weather confined us to our tents, but on September 14 Fountaine was able to start down the Biafo to join Mott. Eighteen inches of new snow had fallen covering the features of a badly crevassed area below us, and he had considerable difficulty in the first part of his journey. Late in the evening of the 15th Russell and two Sherpas arrived from across the Hispar pass, which was heavily covered by new snow. He brought news of the outbreak of war, which he had heard by wireless. The news, though not altogether unexpected, was a considerable shock. We had been in the field only a few months, but European politics already seemed very remote, and it was hard to realize the meaning of the disaster. It seemed obvious that we must abandon the expedition, but the party was too widely separated for immediate

recall, and as less than a month was necessary for the completion of our summer programme, I decided to carry on until we were reassembled in Gilgit. First we had to wait for Fazal Ellahi's party, so that we could make a combined crossing of the Hispar pass, which was likely to become difficult with further snowfalls. He was due back at the dump on September 22.

Russell and I with our three Sherpas went up to the northern glacier of the Snow Lake to explore a way across the main watershed. I had hoped that one of us would be able to make a route to Shimshal, for such a passage would have been extremely interesting, but in the present circumstances a further division of the party seemed hardly justified. After two days we camped at the foot of a steep ridge which led up to the watershed. We were held up there by another heavy fall of snow, but on September 20 we made an ascent of the ridge, which presented us with a fine day's mountaineering and a task that took us all our time to accomplish. Angtharkay and Lobsang came with us to help with the work, but even so we were obliged to leave the theodolite halfway up and did not reach the top until 4.30 p.m. We found ourselves on the crest of the main watershed at a point about 19,500 feet high overlooking a wide snow basin on the northern side. This basin was obviously one of the upper feeders of the Khurdopin. Our regret at having decided not to attempt the complete crossing was intensified by the fact that a gentle snow slope was all that separated us from the Khurdopin glacier, which would have led us to Shimshal. The view from the pass was magnificent and extremely interesting. We took rounds of photographs and compass bearings, but a bitter wind and the lateness of the hour prevented us spending long on top. The descent was much easier than the ascent, and by going hard we succeeded in reaching camp before it was too dark to see.

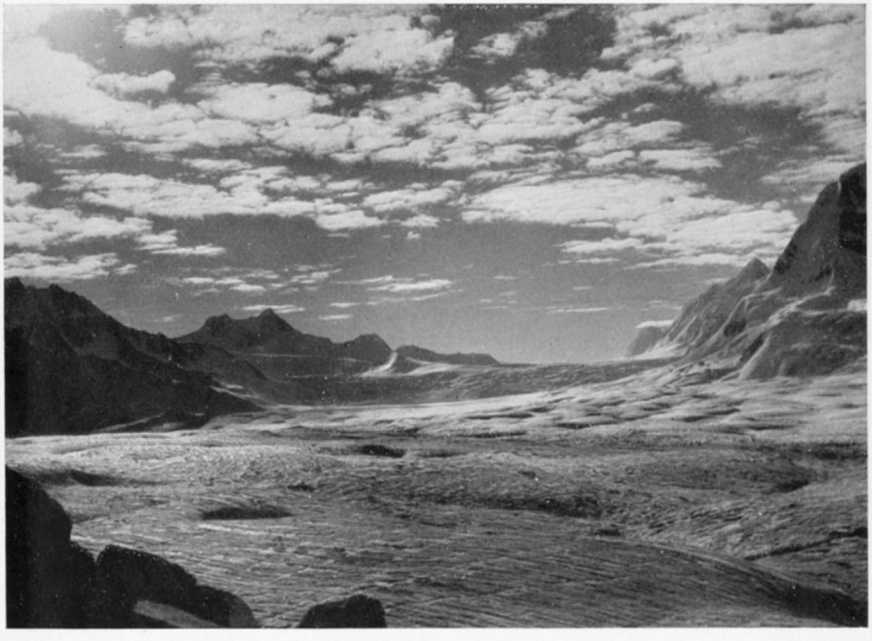
Before going down the next day we climbed to a point which gave us a view of some of the peaks across the eastern wall of the Snow Lake, to which we took angles. We reached the dump on the 22nd, and our arrival there coincided almost exactly with the arrival of Fazal Ellahi's party. He had completed the survey of the entire Biafo glacier and its tributaries from source to snout. His map is a beautiful piece of work. On September 23 we all crossed the Hispar pass to our dump at Kanibasar. From here, on the 24th, Russell set out for Gilgit with telegrams to inform those interested in us of our movements, and to place our services at the disposal of the Government. He had certain physiological experiments to complete at Makorum, but he reached Gilgit on October 3. Meanwhile I stayed with Fazal Ellahi to supervise the completion of his survey of the Hispar basin. First we went up the Kanibasar glacier, where we camped for three nights. Fortunately the weather had improved and held for the next fortnight. I was very glad to have the opportunity of being with Fazal Ellahi for a long time while he was at work. I was impressed by the skill with which he chose his stations, the speed and neatness with which he worked, the accuracy of his fixings, and the extraordinary energy which he displayed. Next we went up the Jutmaru glacier, and here, as on the Kanibasar, we found that the topography bore little resemblance to that portrayed on the existing maps. The watershed at the heads of both these glaciers was very high indeed, and at only one place did I see a chance of reaching it; though there was not time to attempt to do so. At the head of the

Jutmaru we followed for miles the tracks of some creature in the fresh snow. The tracks were a good deal bigger than those made by our boots, and though I suppose they must have been made by bear they did not in the least resemble the bear tracks we had seen in the mud at the sides of the Biafo and Panmah glaciers. The difference was possibly due to the melting of the snow. Fazal Ellahi having completed his work, we returned to Nagir on October 12. At Minapin, one march below Nagir, we met Inayat Khan who, having finished the survey of the areas allotted to him (the whole of the Hispar valley from and including the Kunyang glacier to the Hunza river), had come down to survey the Minapin glacier which he had just completed. We reached Gilgit on October 15, where we found the rest of the party waiting for us.

I had not seen Mott for two months. On August 19 he and Russell had left the camp on the Snow Lake and set off southwards towards the gap in the West Biafo Wall, which constitutes the only practicable pass from the Biafo to the much-discussed Cornice and Garden glaciers (the local names for which are Sokha and Solu respectively). Tilman had first crossed the pass in the 1937 Shaksgam Expedition and exploded the myth, originated by the Workmans, of an enclosed Cornice glacier. It was not at first clear which route Tilman had followed, so the day before they began the journey Russell and I had reconnoitred the most likely col. They camped the first night at the foot of the short glacier leading up to the col, and on the following morning started early. The first part of the ascent was easy, but for the last 300 feet there was a steep ice-slope and some hard step-cutting was necessary. Tilman chose a more gradual route that brought him some way above and south of the lowest part of the col, but he had difficulty in getting down the far side. It was necessary to relay their loads up the final slope and, while the Sherpas were bringing up the remaining loads, Mott attempted to obtain a plane-table fix on the col. Falling snow and the lack of any fixed points for resection made this impossible. The descent from the col presented no difficulties, and they threaded their way easily down the icefall to the dry glacier below. They were now at the head of a narrow valley shut in by giant precipices of rock and snow. A mile from the pass the glacier turned to the left and a steep bluff prevented any further view. When the Workmans, and later Tilman, looked down from a high col at the eastern head of the Sosbon it would have in fact appeared enclosed owing to the curtaining effect of this bluff, but it is hard to understand how the Workmans explained the source of the Kuschuchun Lungma river which they crossed at Bisil.

Mott and Russell's first camp over the pass was on the north side of the glacier, and 2 miles from its head. They found some fuel and a welcome bed of grass after weeks spent above the snow-line. The following day Mott began the survey. There were no fixed points visible, so that he was obliged to lay out a base of assumed length and carry out the whole of this part of the survey to an unknown scale and a relative system of heights. Later, on the Solu, he fixed the scales by tying on to two fixed points which were triangulated on the South Hispar Wall, and while at Askole redrew the map to its correct scale with true contours instead of form-lines. Azimuth he obtained by simple observations on Polaris. The whole of this survey would have been rendered far more difficult, if not impossible, without the assistance of

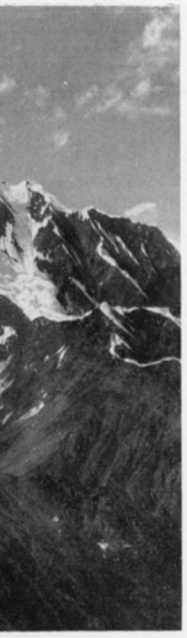
The Snow Lake



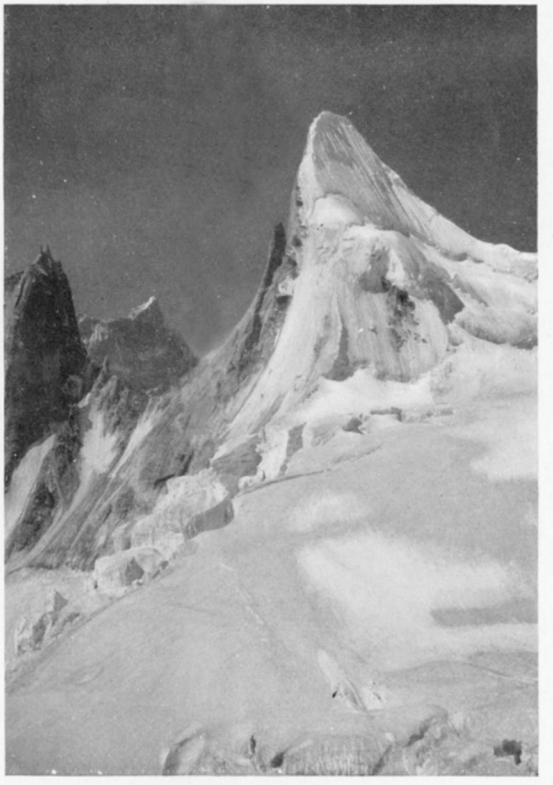
The Hispar pass

Ganchen, on the left, and Hikmul

The divide in the Sosbon glacier



Kero Lungma glacier from the Nushik pass



Peak above the pass between the Nobande Sobande and Choktoi glaciers

Kanjut Sar

Pumarikish

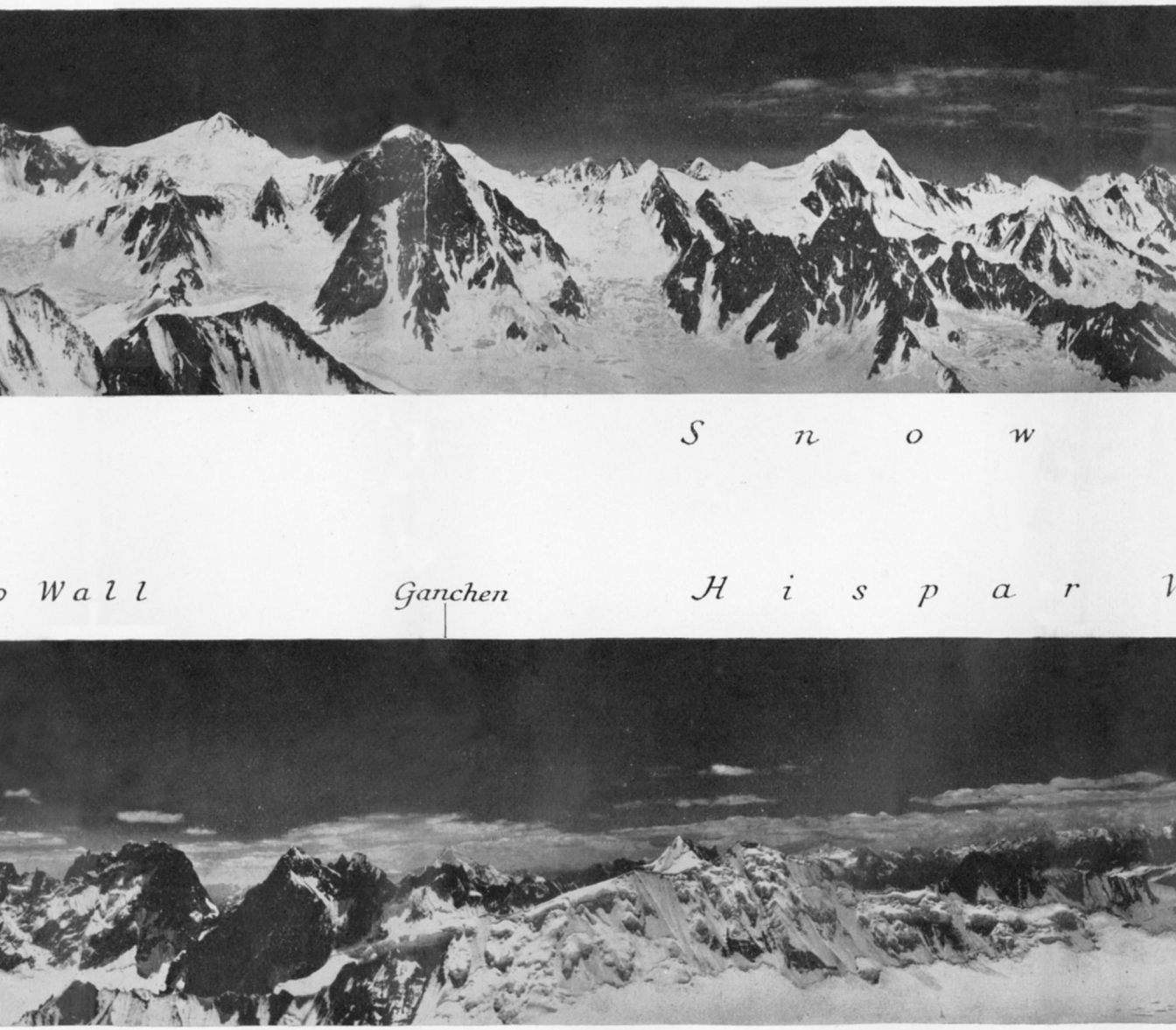
B i

"Ogre" Pk

West Biafo Wall

Biafo Glacier

Panoramas from a peak (19,400 feet) on the His



om a peak (19,400 feet) on the Hispar–Biafo watershed, north of the Hispar pass, looking north and east (top), south and

n Watershed

o w Lake

s p a r Wall

s p a r Glacier

ing north and east (top), south and west (bottom)

the Wild telescopic alidade which enabled him to carry out a graphical triangulation, and fix the relative system of heights with considerable accuracy.

One of the most pleasant aspects of the Sokha and Solu glaciers is the amount of vegetation on the lower slopes. Flowers of every colour and form were a constant delight to the eye during the climbs to the survey stations, and provided Russell with a magnificent field for his botanical work, while a mass of willow and juniper served as an endless source of fuel.

Six miles down the Sokha glacier from the pass a steep and very crevassed tributary glacier descended from a cirque surrounded by gothic pinnacles of rock which Mott was to see again from the west arm of the Sosbon. There are two further tributary glaciers joining the Sokha on the south side. Russell ascended the most westerly of these in the hope of finding a pass over the watershed, but the col he reached (16,500 feet), contrary to expectations, proved to be on a subsidiary ridge south of which a stream led down to the Basha valley.

On the sixth day the party descended the ablation valley on the right bank of the Sokha glacier, reaching the Solu which they crossed, and made camp in the ablation valley on its west bank. The following morning, while Russell continued his botanical collecting, Mott proceeded up the Solu far enough to see round the bend, a mile from its head, where the glacier takes a sharp turn to the east. From his plane-table station, on a hillside surrounded by willows, grass and flowers, he could see the whole of the basin hemmed in by the Biafo rock wall, and the col Tilman reached from the Snow Lake. It is doubtful whether a descent west from the col is possible owing to the very formidable ice fall at the head of the Solu. Tilman did not attempt it. They came across many fresh bear tracks, which are common in this area, though the animals themselves were not seen.

On August 27 they moved down to the snout of the Solu glacier where there is quite a large grazing village named Dabados, where they were able to buy fresh food. They spent two days there rounding off the survey of the two glaciers, and then descended to the Basha valley, whence they travelled to Askole by the normal route. At Askole Russell left Mott and proceeded up the Biafo to meet me on the Snow Lake. Mott returned down the Askole valley as far as Chokpiong to survey the Hoh Lungma and Sosbon glaciers. From his first station on a ridge west of the Hoh Lungma nullah he was fortunately able to pick up Kanjut Sar and Conway's Ogre which, with Ganchen, gave him a perfect fix. The view from this station was magnificent, the whole area to be surveyed being visible. Four main glaciers drain into the Hoh Lumba river. The largest of these, the Sosbon, flows southwards and, at its head, splits into two arms which are divided by a narrow rock ridge. The western arm flows beneath the pinnacles the party had previously seen from the Sokha glacier. It was from a col above its western arm that the Workmans and Tilman looked down on to the head of the Sokha. Tilman took the western arm of the Sosbon for the Hoh Lungma, but according to local tradition the name refers to the glacier flowing north-east from Ganchen. The Hoh Lungma is joined by another glacier, flowing from the west, named the Tailbu. Two weeks later Fountaine ascended this glacier and crossed a col (17,000 feet) at its head to the Basha valley. South of the Hoh Lungma a

smaller glacier, the Chongahanmung, drains into a wide sandy flat. In Spender's compilation the name Zarn glacier appears to refer to this glacier. Owing to bad weather it was two days before Mott was able to get a second fixing. There were several heavy snowfalls and the temperature dropped. At the end of a week he completed the survey of the Hoh Lungma and its adjacent glaciers and moved camp to the divide of the Sosbon. From the top of the ridge he was again able to check his position in relation to Kanjut Sar. Fountaine meanwhile had descended the Biafo glacier after leaving me on the Snow Lake, and on September 18 met Mott in the Hoh Lungma valley just below the glacier.

It had been intended that Mott and Fountaine should work together from now on. But unfortunately Mott had developed a form of septic rash which forced him to lie up for several days, and as the time for the return of the expedition to Gilgit was drawing close it was decided to abandon the proposed survey of the Kero Lungma glacier. When he was somewhat better Mott completed his work in the Hoh Lungma area and made his way back to Gilgit *via* Rondu and Astor, crossing the Ganto La (above the Basha valley) and Harpo La on the way. Lhakpa Tensing, who was suffering from severe toothache, remained with Mott while the other two Sherpas went with Fountaine.

The latter party made their way up the Hoh Lungma glacier and camped about a mile from a steep col at the head of the Tsilbu, which is flanked by Hikmul Peak on the south and a low rock ridge on the north. The next day they set out to cross the col (later named the Hikmul pass). The first one and a half hours were through deep snow, but after that the ground steepened and they had to cut their way up an ice-slope covered by a thin layer of loose snow. After negotiating two difficult bergschrunds, some rocks and a steep gully, they reached the top of the col, from which Fountaine took a round of photographs and bearings. To the east the Ogre Peaks could be seen, while westwards they had a fine view up the Chogo Lungma glacier to Haramosh. It was surprising to see that a few miles from its snout there was a right-angled bend in the glacier. After descending the col on the other side they reached the snout of the glacier by evening. The valley they were in was exceedingly steep and dropped 8000 feet from the col they had crossed to the Basha valley, in a distance of less than 4 miles. This made the descent to the village of Bisil difficult. From Bisil to Arandu the party had further trouble owing to the fact that a rope bridge between the two places was down.

From Arandu Fountaine and the two Sherpas started up the Chogo Lungma on September 26 to attempt to cross the Haramosh pass at its head. They took with them enough food for ten days and carried heavy loads. They followed an ablation valley which ran along the northern bank of the glacier and provided them with an easy route. On the first day they camped early, about 3 miles up the glacier, so that they might prepare a large supply of *tsampa* in order to conserve their paraffin when they got beyond the wood fuel in the higher reaches of the glacier. The next day they continued up the ablation valley, which was wide and well wooded. About 5 miles above its snout the main valley took a decided turn to the north, confirming what they had seen from the Hikmul pass. They passed several deserted shepherd

villages during the day and camped that night by the last willow tree on the north side of the glacier, about 10 miles from the snout. They had left the last of the juniper 2 miles lower down. Here again they found a great number of bear tracks. A little farther on they left the ablation valley and proceeded up a band of white ice on the glacier. At about this point a large glacier joins from the south, at the head of which they saw a col which on their side appeared to be practicable. On the night of September 28 they camped on the south bank, at a point about 2 miles below the junction of Haramosh. On this side of the glacier at about 13,500 feet there was still plenty of willow. The following day they went up the Haramosh glacier and camped on its north bank about 5 miles below their pass, which they reached on September 30 after a laborious trudge through deep snow. The view down the other side of the Haramosh pass presented a dramatic contrast from the great glacier they had just come up. Directly below them at the foot of a steep rock face was a thick jungle. The willow and birch trees in their autumn foliage filled the bottom of the valley with gold and red for 4 miles, where the colour changed to the dark green of pine forest. Beyond this deep well of colour Dobani stood in splendid isolation. To the south stood the mighty cliffs of Haramosh draped in hanging glaciers. Later from one of these they saw an avalanche fall which travelled 4 miles down the valley. They climbed down the rock face, which was quite difficult, and in places dangerous owing to falling stones and ice, and reached the valley 4500 feet below by nightfall. Three days later they reached Gilgit, when for the first time they heard news of the war.

It was difficult in Gilgit to get much idea of what was going on in the outside world, or whether we were likely to be required either in India or in England. However it seemed obvious that we must come back, though it was a bitter disappointment to all of us to have to abandon an expedition which had promised to be one of unusual interest and value. But for all that we are lucky to have been able to snatch a few more months of life from the wreck of the future. The summer part of the programme had been a success. I think that it may be fairly claimed that the geographical problems surrounding the Hispar, Biafo, and Panmah basins have been cleared up once and for all. Triangulation was carried from the Indo-Russian system in the Hunza valley, up the Hispar to the head of the Biafo glacier, which has made it possible to fix the major features accurately; 1750 square miles of this country were surveyed in detail; and several interesting new passes were crossed. A summary of Scott Russell's botanical work is given below.

APPENDIX: BOTANICAL INVESTIGATIONS

R. Scott Russell

The flora of the Karakoram is small compared with that of the central or eastern Himalaya, and few of the species are sufficiently striking to interest the horticulturist. Thus the Karakoram offers but little attraction to the botanist whose primary object is to collect new or beautiful species. To the ecologist however it presents many interesting problems, and its position north of the main Himalayan chain and bordering on Afghanistan and the great deserts of Central Asia makes it an important link between floras of entirely different types.

The majority of botanists undertaking intensive investigations in the Himalaya have been interested primarily in finding new plants, and have therefore been attracted by the more luxuriant valleys farther east. Thus large areas, especially in the higher and more inaccessible parts of the Karakoram, are entirely unknown. The collections of dried plants made by a number of expeditions are of great interest, but in the majority of cases botanical work was but a secondary object, and the collections were consequently small. Thus when we visited the Karakoram in 1939 there was a virtually new field for investigation.

The work I proposed to carry out was divided into three sections: the collection of all flowering plants within the area, an ecological survey, and certain physiological investigations. The curtailment of the expedition due to the European War caused much of the programme to be abandoned. The physiological studies, in which it had been planned to make observations at all times of the year, were especially affected; but the work planned for the summer was completed. Dried plants were collected mainly at altitudes above 11,000 feet from the basins of the Barpu, Hispar, Kero Lungma, Sokha, Solu, and Biafo glaciers, and in the later part of the season the seeds of the most interesting species were gathered. The main herbarium collection will be kept at the British Museum (Natural History), while the seeds are being distributed by the Royal Botanic Garden, Edinburgh. The dried material, representing 870 collections, together with the appropriate field notes, will enable a description of the ecology of the area to be prepared. The full results of the work will be published later, and it would be out of place in this *Journal* to consider them in detail. Some brief description of the general type of vegetation in the region may however be of interest.

The most important factor controlling the development of vegetation in the Karakoram is water supply. In many parts desert conditions prevail and almost everywhere the effect of water shortage is marked. This situation is readily explained by the geographical position of the range. The moisture-laden winds come from the south, the northerly winds, which have crossed the great deserts of Central Asia being dry. To the south the high ranges act as a rain curtain, so that little rain reaches the main Karakoram chain. This curtaining effect is well shown as one approaches the Karakoram from Kashmir; on the hills above Srinagar there are well-developed pine forests and an abundance of alpine plants, while in the Indus valley and at Gilgit the hillsides are generally barren. The rainfall in Gilgit is from 4 to 7 inches a year. It may be noted also that the humidity of the atmosphere in the Karakoram is generally low, due to the strong insulation. In July, at the altitude of 12,500 feet on the Hispar glacier, the relative humidity was below 10 at noon on clear days. In consequence of these conditions the flora of the Karakoram consists of plants which have low water requirements. This situation is in strong contrast to that found in the central or eastern Himalaya, which lie farther to the south and receive the full force of the monsoon. The entirely different types of vegetation found in the two regions are thus accounted for.

In the areas studied on the present expedition little or no vegetation occurred on open hillsides unless a constant water supply was provided by snowfields on the higher slopes. The most varied flora was usually found in the ablation valleys flanking the glaciers. Hillsides with unusually varied vegetation were examined on the southern sides of the Barpu and Hispar as well as above the Kero Lungma, Sokha, and Solu glaciers. In these localities water supply was provided either by seepage from the snowfields or by springs. The aspect of the slopes protected them from excessive insolation. These areas varied in altitude

from 12,000 to 15,000 feet. The highest level at which plants were found was about 17,000 feet.

The most important trees and shrubs were willows (*Salix*). A number of species were collected, varying from small shrubs to small trees 15–20 feet high. Considerable areas of hillside were covered with willow shrubberies beneath which a wide variety of herbaceous plants was found. Juniper (*J. pseudosabinus*) was less abundant but occurred, often as isolated trees in rocky places, over the greater part of the region, while at the lower levels roses were common. Other trees were in general absent. A few of the more interesting herbaceous species may be mentioned, but it should be noted that, until the collections are compared with type material, the specific determinations must be regarded as tentative. Between the altitudes of 12,000–13,000 feet a species of aconite (perhaps *Aconitum violaceum*) with striking bluish-purple flowers was often common. It was particularly abundant in the Sokha valley. *Papaver nudicaule* was collected in many localities, but it was nowhere abundant; no other poppies were found. In almost all localities between 12,000 and 14,000 feet the blue geranium (probably *Geranium pratense*) was one of the most common and most striking plants. Several epilobiums were collected, including the large-flowered *E. latifolium* growing usually on semi-stable moraine. The family Leguminosae was well represented, mainly by species of *Oxytropis*, *Hedysarum*, *Lathyrus*, and *Astragalus*. A number of species of *Potentilla* occurred commonly. In dry localities *Sedum* species were among the most important plants. A number of asters were abundant in grassy slopes. Another interesting composite was *Saussurea*, which grew only above 15,500 feet. Several primulas were found, usually in moist localities at fairly high levels. *Acantholiunum lycopodioides* was a striking plant in dry localities between 10,000 and 11,000 feet. The family Gentianaceae was represented by several gentians of which the most widely distributed was the small *Gentiana venusta; Pleurogyne spathulata* occurred in restricted areas mainly by the Sokha glacier. Striking blue patches of *Martensia Tibetica* were found in a few places above the Hispar glacier, while a small species of *Myosotis* was abundant in the ablation valleys. At the margins of *Salix* shrubbery species of *Pedicularis* were frequent.

The purpose of the physiological investigations was to show the effect of the environment on the metabolic processes which control plant growth, more particularly those by which carbohydrates are formed and utilized. A large amount of laboratory analysis will be necessary before the results of this work are available. Similar investigations were carried out in the Arctic by the Imperial College Expedition to Jan Mayen in 1938, and one of the interesting applications of the present results will be to compare the effects of high mountain and arctic conditions on plant growth. The environments are similar in many respects, notably the long cold winter, but on the other hand the quality and duration of sunlight, most important biological factors, are markedly different in the two cases. Field investigations of this type are at present seldom undertaken, but eventually they should lead to a full understanding of the manner in which different climates affect the growth processes of plants.

As by no means all parties whose object is geographical exploration include a botanist, it is appropriate to consider the importance of botanical work in geography and the type of investigation which can be undertaken on an expedition travelling in difficult country. In a recent discussion (*Geogr. J.* 91 (1938) 338) Sir Francis Younghusband defined the function of geography as being the description of the surface of the earth. Except in heavily glaciated or desert regions the plant-covering is one of the most important features of the earth's surface. Geographers naturally regard with little interest botanical publications

which consist solely of enumeration of species occurring within a given area. But if the botanist is prepared to devise physiological and ecological methods which can be applied in the field he is able not only to describe the flora, but also to discuss the vegetation in relation to the prevailing climate on the one hand and the nature of the underlying rocks and the development of land-forms on the other. Such results should be of value to the geologist, the meteorologist, and the geographer.

A light expedition naturally sets rigid limits to the amount of collecting material and other apparatus the botanist can employ, but even so much valuable work can be done. Careful organization is much more important than elaborate equipment. On the present expedition the equipment required for the summer totalled little more than two coolie loads, while on journeys from the base depot on the Hispar glacier never more than one load was taken. Nor is an elaborate camp necessary. Though it is no doubt more pleasant to sort one's specimens sitting at a table, the job can be done with equal efficiency reclining on a sleeping-bag in a bivouac tent. I would disagree with the opinion recently expressed that the conditions of a light expedition are not conducive to exact scientific work. In the Karakoram the amount of time and energy expended in transporting camps and quelling disputes among coolies increases in geometric ratio to the size of one's *bandobast*. It is a tribute to the powers of organization of many early explorers that, with their elaborate outfits, they had time to bring back any results at all. In this connection it is of interest to note that in the arctic, where detailed botanical work has been carried out more often than in the Himalaya, small and mobile expeditions seem in general to have been more successful than parties with elaborate bases. At the same time it is obvious that where transport presents no difficulties nothing is to be gained, and a great deal may be lost, by the indiscriminate restriction of supplies and equipment. Such conditions are however seldom realized in difficult mountain regions.

DISCUSSION

Before the paper the PRESIDENT (Field-Marshal Sir PHILIP CHETWODE) said: Early in the summer of 1939 Mr. Eric Shipton, with Mr. Scott Russell, Mr. Peter Mott, and Dr. E. C. Fountaine, returned to the Karakoram to resume and if possible complete the explorations upon which he gave us so important a paper on 10 January 1938. He had filled in several blanks upon the map of the northern face of the Karakoram range and the Shaksgam region, already known to us from the discoveries in 1887 by Sir Francis Younghusband and by Professor Mason in 1926.

In September 1939 Mr. Shipton heard of the outbreak of war and felt it his duty to return to place himself and his companions at the disposal of the Government of India. We have recently heard that after spending some months at Dehra Dun working up and handing over his survey results to the Survey of India, he is now under orders to join the Indian reserve of officers for training. His companion, Mr. Scott Russell, is primarily a botanist interested in the physiological side of that science. He came home two or three months ago, and we are fortunate in having him here to give us the substance of Mr. Shipton's paper. He is shortly to return to the East to take up a scientific appointment.

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

Sir FRANCIS YOUNGHUSBAND: It has been a delight to me to listen to the interesting lecture and to see these beautiful slides. I visited the country over fifty years ago, and in those days the photographic apparatus of the portable type had not been invented. Therefore when I lectured to the Royal Geo-

graphical Society in 1888 I had to rely upon my own description, and being unable to illustrate the country by means of lantern slides, I said that the region I had traversed resembled hundreds of Matterhorns put together. That was the nearest I could get to it, and I remember seeing Mr. Douglas Freshfield raise his eyebrows at such a description. But after looking at the slides shown during the course of this lecture I am not so sure that I was wrong. You will have noted the extraordinarily spiky character of the peaks in that region.

I was glad to hear the lecturer mention that great surveyor Colonel Godwin Austen, of the Survey of India, who was the original explorer of this region. He did not get over on to the far side of the Himalaya, but surveyed all this part on the near side. On the map he then made all other maps have been founded.

I was led to doubt as I listened to the lecture this afternoon whether it is advisable to send such large expeditions into those regions. Perhaps it would be better to confine one expedition to making the map, another to botanical purposes, another to zoological, and so on. It is really a great tax upon the peoples of the country to be taken out of their homes and carried across most inhospitable regions at great risk to themselves. I would also suggest that a great deal more use should be made of the men of Hunza. They in my time were the raiders who crossed into Central Asia. They made marvellous expeditions across the mountains, with very little food, and had to return carrying all the booty they could. They are most hardy men and good mountaineers; and their diet, as it happens, is perfect. I should say that just as a good deal of use has been made of the Sherpas, so in future more might be made of the men of Hunza who are there on the spot.

The object of my journeys in 1887 and 1889 was to ascertain if there was any way by which the Russians could send an expedition across the Himalaya. I think from the slides you have seen this afternoon you will realize that that is impossible so far as the region visited is concerned. I came across the old Muztagh pass a little farther to the east. I did not go up the Biafo glacier beyond the snout of the Panmah glacier to discover the "New Muztagh pass." But I saw quite enough to be able to report to the British Government that there was no possibility of Russian forces being able to cross the range.

I thank you very much, Mr. Scott Russell, for the paper you have read. It has given us a most encouraging idea of what can be done in the region, and we look forward to other expeditions going there.

Professor KENNETH MASON: In the first place I should like to congratulate Mr. Shipton and Mr. Scott Russell on their fine performance and their excellent survey work in difficult country. The map that they had to commence with was mainly a compilation of Lord Conway's very rapid plane-table traverse up the Hispar, down the Biafo, and up the Baltoro glaciers, and of the Workmans' surveys, of which we have heard to-day. The latter, unfortunately, were not trained surveyors. It was not until 1912–13 that we were able to take a really accurate triangulation up the Gilgit and Hunza valleys. By the way, the stations mentioned by the lecturer in the Hunza gorge were not visited by me but by my assistant, Mr. V. D. B. Collins. I worked back from the Pamirs and joined on with his work farther north. Our stations on each side of the gorge were not very high; we made a rule to go no higher than we had to. The country is extremely difficult. We were observing to light signals, which meant leaving men on the mountain-tops, perhaps for a week on end, ready to show a lamp by night or a helio flash in the sun by day. The average height of our stations was as low as 17,000 or 18,000 feet, but we had to carry up heavy theodolites. It is a very different matter to-day when one can use a light field theodolite for stereo work: the modern mountain surveyor can now climb with a light

instrument, take a round of photographs, and come down. Moreover present-day surveyors can use the points their predecessors fixed, the earlier surveyors could not. We must not therefore be too hard on the Workmans and others who went before. When we joined our triangulation with that of the Russians the probable error was only 1·5 metres, so that we were not far out.

As to Sir Francis Younghusband's reference to the Hunza men, I would emphasize that the Hunza man is much more reliable than the Nagir man as a climber, especially on rock. Only last night I was talking to Sir Robert McCarrison, the expert on diet, on this subject at Oxford; he attributed it firstly to the fact that the Hunza man's diet is better and more suitable than that of the Nagir man; secondly—and this will appeal to biologists—the Hunza man lives on the sunny side of the valley; the Nagir man on the shady side. The Hunza man is bright and laughing; the Nagir man is dour and sad. The Hunza man is a better climber and a happier man, and he will never let you down.

Fazal Ellahi is a magnificent surveyor, as good as the best of Indian surveyors, which is high praise, and a very worthy successor to the old pundit explorers and other excellent men in the Survey of India. His immediate predecessor in the line, who served so well with me, Khan Sahib Afraz Ghul Khan, a recipient of two of our awards, is now tehsildar at Gilgit and anxious to help any one who goes to that part of the world in the future.

I should like to ask the lecturer whether he saw the Yenguts Har glacier, one of the most interesting glaciers of Nagir, in a side valley near the village of Hispar. In 1902 it came forward so quickly that, according to native report, it caught up two old ladies who were running in front of it! I do not altogether believe that story, but there is no doubt that it moved forward 2 or 3 miles in about six weeks. It could be seen advancing. It has been deteriorating since then until it is now 3 or 4 miles farther back. Up in its basin there has been a heavy accumulation of ice and snow; and there is no doubt in my mind that this accumulation must be released shortly. This will happen either in May this year, in May next year, or in May the year after. If anybody likes to be on the spot with a cinema camera, when the "corn is a hand's breadth high," he will be able to photograph something that has never been photographed before.

Captain KINGDON WARD: It is always a pleasure to a botanist like myself to see the younger generation carrying on the work of botanical exploration. I came here full of anticipation to hear what Mr. Scott Russell had to say about the plants of the Karakoram. When I saw the magnificent photographs of snow-peaks and glaciers, bergschrunds and crevasses, I could not help thinking that possibly Mr. Scott Russell was botanizing at a slightly high elevation; there did not appear to be very much flora there. However I gather he was deputizing for his leader and that he had for that reason to concentrate more on the climbing and cartography than on the botanical work. If he had had his own way, I think he would have told us some extremely interesting facts about the flora of the Karakoram.

I was particularly glad to hear Mr. Scott Russell say towards the close of the lecture that people are not only interested in lists of the flowers which grow in these places, but also in the study of their associations and the conditions under which they live. I should much like to have heard something on that aspect. I have always felt that the Karakoram is not really a botanist's paradise, such as the Eastern Himalaya, so I am not proposing to go there to look for plants; it is outside my scope. Nevertheless, I hope that at some time Mr. Scott Russell will have more to tell us about the plants he saw.

Mr. MICHAEL SPENDER: My principal feelings about this paper are of pleasure and gratitude at seeing some pictures of mountains and thus being reminded

that the mountains are still there. Nevertheless, I feel bound to enter into something which is dangerously near to being ponderous, because I should like to relate this expedition to the journeys of previous travellers in the same region. It was Conway who first ascended the Hispar; he made a very good survey indeed; but others came along later and in their efforts at map-making got surveys of the district into appalling confusion. What Shipton did was to tidy up in one fairly short expedition the work of several expeditions. He used his forces and disposed his food and Sherpas so that he did in the course of a short time an amount of work which would have taken an earlier expedition a great number of seasons. It is important that none of this was new work over new country. It was all done simply out of the feeling that it had got to be done; the surveys of this area had to be straightened before he could get on to what he really wanted to do.

Shipton likes going to new country; he likes exploration. When we finished in 1937 we left one or two fascinating problems unsolved. There was the great patch of country near the Aghil pass to which Sir Francis has just referred, which is still unexplored. Looking to left and right from that pass we saw a large area of country still to be spied out and put on the map. That was what Shipton was looking forward to going back to. He had planned to spend the summer of 1939 doing the duty part of the work, and to spend the winter doing the interesting part. That point was not brought out during the paper, so I hope you will forgive me for stressing it now. It is important to me and important, I am sure, to Shipton.

Shipton went to the mountains for their own sake. At a time when so many do things for the wrong reasons—because they will get some *kudos* or promotion or because the newspapers will write about them—it is important that there should be those who insist on doing things for their own sake; that there should be those who insist on removing inessentials, on discarding what is unimportant to the job in hand. That is why Shipton has been a successful leader, a leader with whom it has always been and always will be a great inspiration to work. He spent the summer preparing and laying the foundations, so to speak, laying out his depots in more senses than one, anticipating an interesting winter's work. I want you, in judging the expedition, to realize that it was cut off before the main part had begun and after the foundations had been laid.

Mr. SCOTT RUSSELL: Sir Francis Younghusband has stressed the desirability of using Hunza men as porters. We were unfortunately unable to do so as we were travelling through Nagir, and a healthy rivalry exists between the two states. It would have given rise to great complications had we attempted to take Hunza men through Nagir.

Professor Mason has mentioned the interesting Yenguts Har glacier. Unfortunately when I passed it on my way up to Hispar it was shrouded in mist, and on the way down I was hurrying to Gilgit, so I was unable to examine it. It was however mapped by the surveyor Inayat Khan.

The PRESIDENT: It only remains for me to ask you to thank the lecturer for the extraordinarily interesting afternoon he has given us, and especially for those wonderful photographs. I have had the privilege of actually looking upon those magnificent peaks from a distance because, as an irreverent young subaltern, I went in 1890 to that part of the world, through Kashmir, after a gentleman we knew as Lal Palu, or the Red Bear. Again as Commander-in-Chief in India I spent ten days or so in the dignified and contemplative recreation of fishing in those wonderful streams in Kashmir. For the benefit of those who have not seen the country, I may say that the photographs have not exaggerated it in the least.