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BOTANICAL AND GEOGRAPHICAL EXPLORATIONS IN TIBET, 1935: *A paper read at the Evening Meeting of the Society on 20 April 1936, by*

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TOWARDS the end of April 1935 I left Tezpur in Assam, and early in May reached the inner valleys of the Assam Himalaya. The climate here at 6000 feet is warm temperate, and the rainfall moderate, with long winter drought. Consequently the dense rain forest of the outer slopes is replaced by open forests of Oak, Pine, and Rhododendron.[1] Travelling leisurely over the hill ranges from one tributary of the Bhareli river to another, and halting here and there to explore the rich flora more fully, I reached Senge Dzong on May 28 (see Folding Map at the end of the *Journal*). I was now on the Se La range, which separates Assam from Mönyul, and still awaiting a permit to enter Tibet. At last, permission having been granted, on June 3 I was able to cross the Se La, a pass about 14,000 feet high. The monsoon had just broken. For the next few days I followed a new route, and crossing four more passes, each one higher than the last, had a hard struggle through rain and snow. The alpine flowers however compensated for any discomfort. From Senge Dzong to the Tibetan plateau, the country is lofty but deeply eroded, sparsely populated, and entirely uncultivated. The inhabitants are Mönba, and live on their herds; all grain is imported. Both men and women wear close-fitting, saucepan-shaped, black felt hats, something like those worn by the Persian peasants. Men's hats are distinguished by four short tails twisted from the rim: women's hats are fringed with tails. The women also wear ropes of immense amber beads hanging from their ears.

The first pastoral village I reached was Luguthang (or Lungdang) a small settlement of cold stone houses huddled together on a steep slope, above the tree line. The maps show Luguthang on the Mago chu, but this is incorrect. A high range called Zabu Pu divides the Mago river from the Lungdang Shung chu, which latter rises only a short distance above the village and flows independently to the Tawang river. Crossing this range by the Truker La, a rocky pass of about 16,000 feet, still under snow, I reached the Gorjo chu,

[1] *Pinus excelsa; Quercus Griffithii: Rhododendron arboreum* principally.

which has its source amongst the snow peaks of the Assam Himalaya. Thence crossing the low Chera La, a very steep descent brought me to the Dungma chu, and to Mago. Mago consists of two herd's villages, Dyuri and Nyuri, meaning left hand and right hand respectively, in allusion to their being situated one on the right the other on the left bank of the Goshu chu, which here joins the Dungma chu. The combined river rushes into a gorge, and about a mile farther on is joined by the Gorjo chu. There is no path down the Dungma chu from Mago. It may be noted that the names Dyuri and Nyuri are reversed according to our reckoning; Dyuri being on what we should call the left bank. The two villages together are known to the outside world as Mago. Captain Sherriff and Mr. F. Ludlow were here in 1934. Colonel Bailey and the late Major Morshead visited Mago in 1913, and later it was visited by Neville. The altitude is 11,800 feet (Bailey). Most of its trade is with Dirang Dzong, a large village in the valley below Senge Dzong, but reached by a different route from the one I followed *via* Luguthang. Just above Mago is a hot spring, the water, which smells strongly of sulphuretted hydrogen, bubbling up from under a rock at so high a temperature that it is impossible to hold one's hand in it. Nevertheless several species of Alga flourish. The local people have not troubled to build a bath, nor do they make any use of the water, either for medicinal or ablutionary purposes.

Beyond Mago there are no villages until the plateau is reached, though the herdsmen migrate in summer to a small hill station called Chunak—Black-water, so called from the black slate mud with which a glacier stream is charged. The houses though small are solidly built of stone, but are only occupied between June and October. Other smaller summer villages are Chumba and Lap, the last-named at an altitude of about 14,600 feet.

Continuing my journey northwards, I crossed the main Himalayan range by two high passes, the Tulung La and the Pen La, on consecutive days. Both are over 17,000 feet. After crossing the Tulung La, I left the forest region behind me and entered upon the dry treeless plateau. From the Se La to the Tulung La, the country showed every sign of intense glaciation, though I saw only a few small glaciers. North of the Pen La however there is no trace of glaciation.

On June 11 I reached Karta. There is a small monastery with hovels clustered round it, and a picturesque *chorten*, called the *labrang* (literally, office). Big houses, interspersed with ruins, are scattered over a shelving gravel terrace between two deeply sunken streams, the Tak chu from the Pen La, and the Hlanga chu from the east. These streams unite immediately below Karta, and are the true sources of the Subansiri, which thus rises at the extreme western end of the Assam Himalaya. Looking down the valley from above Karta, a fine snow peak 22,713 feet is seen to the east. I now found myself in a very arid region. All crops are irrigated, the water being brought from a distance of several miles. At this season the fields were brilliant yellow with mustard, and the irrigation channels blue with a charming "Sibirica" Iris. Trees—Poplar and Willow—grow only where they are protected from the wind and spoliation. Down by the river, in sheltered spots are Hippophäe trees. There is a sort of country club out in the fields, surrounded by a wall, behind which grow trees and flowers. Here I stayed two nights. Continuing

northwards I reached Tongme Gompa where the Loro Karpo chu from the west joins the Loro Nakpo chu, to form the Loro chu. The Loro Karpo chu flows eastward, parallel to the Himalaya, in a wide stony valley, but was now almost dry; we were across it before I realized it was a river at all. Most of it is drawn off to irrigate the crops at Tongme Gompa, but for two or three months there is more water coming down. I now turned east down the wide valley of the Loro chu. There is much cultivation here, and by the river dense thorn thickets of sage green Hippophäe; but the valley soon narrows to an arid gorge, and these fleeting signs of fertility disappear. About a mile east of Tongme Gompa is a *stupa* shaped rather like some of the pagodas in Burma; and across the valley is a fine view of the western end of the Assam Himalaya. I was much struck by the contrast between the large size of the valley here, which was both broad and deep, and the small size of the river. Farther west, the valley grows larger as the river shrinks. Formerly the valley was filled with gravel and a series of terraces show where the river flowed when there was more water in it. This present misfit is characteristic of many of the plateau rivers, and is accounted for by the gradually disappearing glaciers which feed them. In 1924 Lord Cawdor and I, travelling south from Tsetang to Tsona Dzong, had crossed one of the headwater streams of the Loro chu. It was the depth of winter, but even so the contrast between the wide stony valley and the paltry stream which flowed through it was notable.

I reached Chayul Dzong (or Chadze) on June 19, a squalid village of hovels in an arid valley, harassed by a perpetual wind. The monastery is worthy of a better background. This was to be my base, but a glance was enough to convince me that few plants grew on these hot dry rocks. Looking eastwards down the gorge however I saw high forested ranges muffled in cloud day after day, so Chayul Dzong was not far removed from a more genial climate. There was more life down by the river than might have been expected in so dry a region. Birds were plentiful in the Hippophäe thickets. I noticed hoopoes, chough, wagtail, kingfishers, rose finch, partridge, babbler, doves, rock pigeons, and several smaller birds. Along a low stone wall built to train the river, voles were common; and in a small pond I found frogs. Between 11,000 and 14,000 feet, it is only necessary to water the ground and almost anything will grow. Irrigation however is difficult in the deep main valleys, and so most of the population live in the higher valleys, above 12,000 feet.

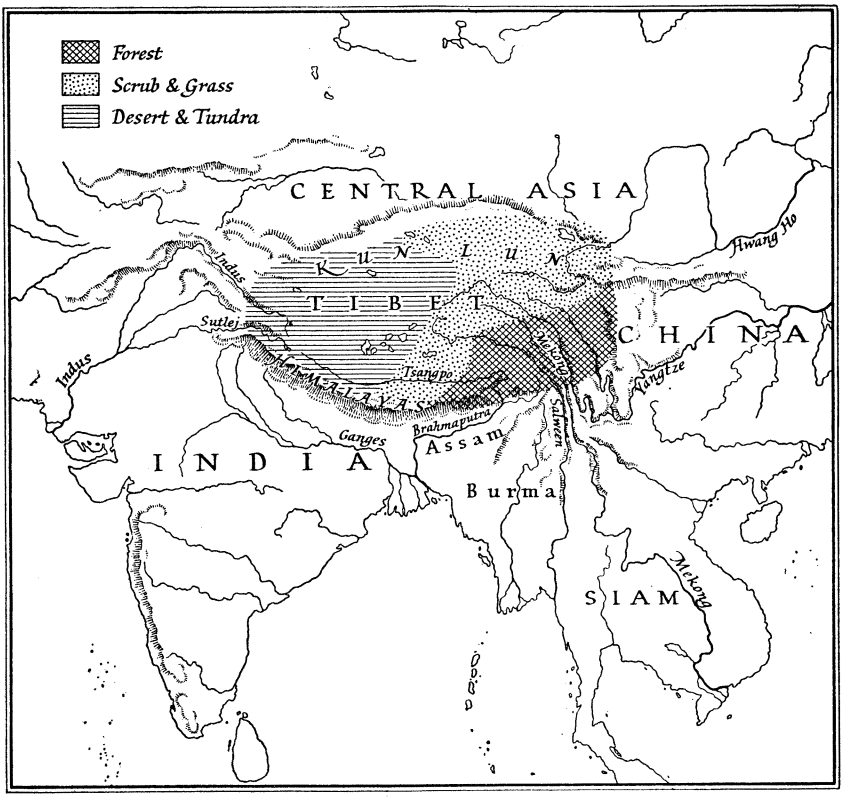
I was now in that extensive region of Southern Tibet, lying between the Assam Himalaya and the Tsangpo through which Colonel F. M. Bailey and the late Major Morshead had passed during their journey of 1913. Morshead had discovered that the Subansiri rose behind the Himalaya as far west as the 92nd meridian, and that it was the headwaters of this river which drained the plateau here.[1] It was not difficult however for the most part to avoid their routes. To naturalists it is virgin territory, so that as a botanist it did not matter if I followed in the footsteps of the pioneers. The only map I had with me was a copy of Morshead's reconnaissance survey on the 1/8-inch

[1] This had long been suspected, owing to the great size of the Subansiri in Assam. In the General Report, Survey of India, 1877–78, Captain Woodthorpe wrote: "That the Subansiri rises behind the high snowy peaks seen from Tezpur I think very likely from its size and velocity. . . ." Bailey and Morshead proved the truth of this surmise.

scale, which proved invaluable. This I used to check my own traverses across unexplored areas south of the Tsangpo.

I stayed only a few days at Chayul, and then set out on what I intended to be a month's journey.

My first march eastwards, down the Loro chu to Trön, was a long and hot one. Just above the Nye chu confluence, the road crosses to the right bank, and so continues for several miles. At the portals of a savage looking gorge, where the Loro chu appears to be (and probably is) entering the Himalayan range, the road returns to the left bank and becomes difficult. First it ascends



the cliff by means of a built-up path and rock ledges. Finally a vertical ladder, very awkwardly placed, and some 40 feet high, has to be climbed; luckily it is a real ladder, not just a notched pole. At one time there was an easier road at the foot of the cliffs; but the bridges are all broken, and the people have not troubled to repair them. In the evening we reached Trön, a village on both sides of the valley. Like Rima it is, or was, a penal settlement. A stone tower, in the base of which is a dungeon 12 feet deep, stands on the brink of the precipice. Condemned criminals used to be flung from the tower, but this punishment is now obsolete, though the dungeon is used. In winter jungle tribes come up the valley for salt. Some go to Sanga Chöling—these are called Chachu Or, and some to Chayul Dzong, these are called Chachu Kung; but

probably they are both clans of one tribe, the people who in Assam are called comprehensively Dafla (or possibly Aka). When the snow melts on the Himalaya, they also come over two passes, the Kashung La, south-east of Trön, and the Hla La, almost due south. Both passes are on the headwaters of the Kamla river, a large tributary of the Subansiri, which rises on the southern slopes of the Assam Himalaya. The salt is not a local product, but is brought from interior Tibet down the Nye chu. Before being sold to these Chachu (or Lopa) it is mixed with the dried sprigs of a common alpine cushion plant (*Arenaria polytrichoides*). This looks at first blush like sharp practice, but it is not. The Arenaria absorbs the water taken up by the hygroscopic salt; otherwise the Lopas, by the time they got back, would have none left, it would all have deliquesced. In exchange for the salt, the Lopas bring cane, skins, condiments, such as chilis and star anise (Illicium), and rice. Inter-village warfare is common amongst these savages, and whole villages disappear; but they give no trouble to the Tibetans, on whom they are entirely dependent for salt. It is unlikely that the Tibetans will penetrate farther east by the Subansiri headwaters.

From Trön I crossed the range to the north by a high and steep pass, the Drichung La, reaching Charme on the second day. The path follows a ridge instead of a valley, and we took yak transport. Above Trön we quickly reached a moister zone, and found many beautiful alpine flowers, including the rare anemone-like *Adonis brevistyla*, and *Primula Roylei*. From our first camp on the ridge above Trön we had a wonderful view into the yawning chasm of the Loro chu, buttressed by the spurs of the Himalaya. I also noticed a glacier west of us, on the same range. The Drichung La is very steep on both sides. Near the summit I found a new species of primula (*P. consocia*) and the charming dwarf *Meconopsis bella*. On the north side we descended a glaciated valley, but soon left it for a ridge. This was the first authentic signs of glaciation I had seen since crossing the Pen La. The Drichung La is about 17,000 feet.[1] From Charme I followed up the river to Sanga Chöling, the only considerable village in this part of the country. There are two fine monasteries. I was well received by the officials, one of whom had travelled with Sir Charles Bell some years previously. When I said I was a friend of Sir Charles' he could not do too much for me. I easily obtained permission to continue my journey to Tsari, a district I was anxious to visit for botanical reasons.

On the hot dry cliffs of the Char chu were great numbers of ugly black lizards. They attain a foot in length, and are found up to 12,000 feet. This lizard is common also in the dry Tsangpo valley, but does not occur beyond. In the very similar Salween valley (similar as regards its arid climate) a totally different genus is found. From Sanga Chöling I crossed the Cha La, 16,610 feet. In the narrow ravine above the Char chu, I was surprised to find forest, or at any rate trees (Conifers) growing on the cliffs, but we soon reached the

[1] I had no instruments with me. The heights given therefore are guesses, and I am fully aware of their crudeness, but a considerable experience of Tibet gives me some confidence in guessing. Moreover I had two useful standards of comparison—the nature of the vegetation, which to a field botanist is eloquent, and the heights of neighbouring passes over the same range, as given on Morshead's map.

alpine region, and a wealth of beautiful flowers. Looking back, I saw a fine snow peak, with one large and two small glaciers on the range south of Sanga Chöling; probably near the Le La, which is on the main route to Chayul Dzong. We reached Chösam, the first village in Tsari, in two days. After crossing the Cha La, although still within the Subansiri basin (the Tsari river flowing south-east) I was really over the second of the two fold ranges which lie between the Assam Himalaya and the Tsangpo. Takpa Shiri (commonly called Tsa Ri) is not, I believe, on the Himalaya but on the southernmost of these two lesser ranges.

Chösam, although a considerable village of stone houses, has no cultivation; it is another herd village. Not only is the Tsari valley, from Chösam eastwards, a typical ice-worn valley, but on the Takpa Shiri range immediately to the south are several short hanging glaciers. At Totsen the valley widens out into a great marshy meadow, now gay with millions of yellow *Primula sikkimensis* and violet iris. This is clearly a silted-up glacier lake basin. We covered the long march—about 18 miles—to Chickchar in a day; and I found the flora of this moist valley very similar to that of Tumbatse. Adonis was abundant. *Meconopsis betonicifolia* occurred lower down, where forest began, but was much less common than either *M. paniculata* or *M. simplicifolia*. Here I found the unknown *M. argemonantha*.

Chickchar boasts almost as many monasteries as houses. It exists by and for the pilgrim traffic. Although in ordinary years pilgrims are comparatively few, over fifty passed during the three days I spent here. Every twelfth year there is a special pilgrimage round Tsa Ri. The Tsari valley is much wetter than the other valleys to the south, lying just behind the Assam Himalaya in approximately the same longitude. It differs from them also in being ice worn instead of water worn. It is tempting to assume that the great glaciers have ploughed wide furrows through the ranges, thus letting in the moisture-laden winds from Upper Assam. But a moment's reflection shows that this theory is untenable. It was those same moist winds which nourished and kept alive the glaciers; and still do so to some extent. A small glacier hangs right over Chickchar. Some other explanation for the wetness of the Tsari valley must be sought. Pheasants are absurdly tame at Chickchar, and come right out into the open. They are never molested. A magnificent cock Harman's pheasant (*Crossoptilon harmani*) used to come out every morning within 50 yards of the house where I stayed, and call truculently. One afternoon (July 4) I walked right into a family of Harman's pheasants, the chicks, which were about two weeks old, running squawking in all directions; but the old birds made hardly any attempt to get out of the way. Even more tame are the grey rock pigeons.

From Chickchar I went some miles down the forested valley to the last Tibetan, or rather Tibetanized, village called Migyitun. Below Chickchar the valley changes its appearance, the river falling very steeply, broken by terrific rapids. Pilgrims to the sacred snow lake Tsoga near Migyitun stay in a sort of monastic inn. A large glacier torrent from the snow peaks to the north-east enters the Tsari river here. It is a long day's march eastwards to Tsoga, over three passes. From the last pass, about 17,000 feet—there was snow on it—a fine range of snow peaks, their glaciers entering the lake below,

Gorge of the Loro chu seen from above Trön, Assam Himalaya in cloud

Meadows at Chickchar, Tsari

came into view. There is nothing very remarkable about Tsoga however, which is an ordinary glacier lake, half filled up. The water is not even blue, as the mud has no time to settle before the water flows out through a valley to the Tsari river below Migyitun. But the view of it from the pass is certainly impressive. My coolies having acquired merit by walking round the lake, we returned to Migyitun and marched up the valley again half-way to Chickchar. From this point I turned north, with the object of reaching the Tsangpo by a new route. Crossing the Bimbi La,[1] an easy pass not much over 15,000 feet, we descended to a considerable river, flowing in a deep valley from the south-west. Towards the north-east, down stream, I noticed a snow peak with glaciers, while immediately north of the river were more snow peaks. A day's march down the valley brought us to a village called Ken, or Sumbatse. In the foreground, across the river, a conspicuous rocky ridge divided it from another equally large river (Ka chu) to the east. We were again in a drier region, characterized by rosette and fleshy leaved plants and few trees; but it was the height of summer and there were many beautiful flowers, such as blue larkspur and *Dracocephalum*, pink *Androsace*, and violet *Onosma Hookeri Wardii*.

On July 14 a half-day's march brought us to Kyimdong Dzong, only a few miles from the Tsangpo. Here I was welcomed by a grave-looking courteous *dzongpön*. Instead of going straight to the Tsangpo I decided to continue my explorations, and to cross the Lang La, and reach Lilung. Turning eastwards again up a cultivated valley, I crossed the pass at its head, and came to the sources of the Lilung chu. The weather was very wet, which ruined the view; but I could see glaciers on the snow peaks above Ken, part of the Himalayan range, to the south-east of the Lang La. The Lang La, though steep on both sides for the last 1000 feet, is not a difficult pass. A long march down the alpine valley brought us to Nepar, where the stream from the Lang La joins the larger Ne chu. Though we were not in a specially wet region these alpine valleys north of the Himalaya get their share of rain in summer, and are vivid with coloured forms of *Primula alpicola*. It was interesting to observe that *Primula Florindae* had now definitely replaced *P. sikkimensis* in bogs. East of Nepar is a sacred mountain of no great height, called Trashi Gola, in the district of Tsari Sama. A few hours' march down the Ne chu brought us to Barang Shiga and Molo, where another large stream, the Sama (or Lagong) chu, joins in to make the Lilung Chu, which is the largest tributary the Tsangpo receives on the south bank for very many miles. From Barang Shiga to Lilung on the Tsangpo is a long march by a rough track. It took us ten hours. About 8 miles from Lilung the slates and sedimentary rocks of which these two fold ranges we had crossed are built, at last gave place to granite. On the cliffs *Lilium Wardii* was just coming into bloom, its lovely pink flowers scenting the path. This is the farthest west it has been recorded, and probably its western limit.

The gorge of the Lilung chu is well forested with Picea and Larch; lower down, large trees of *Quercus Ilex* appear. As the Tsangpo is approached

[1] Kinthup crossed the Bimbi La in 1883, whence Totsen (Tsoga) village was reached, "where there is a monastery and a big lake . . ." It is unlikely that this refers to the Tsoga above Migyitun. Records of the Survey of India, Vol. VIII, Part II.

however mixed forest gives place to almost pure Pine forest (*P. tabulaeformis*). From Lilung eastwards even the dry Tsangpo valley is fairly well wooded, forest presently approaching the river bank, and even bed; but there are still sand dunes, partly clothed with sand-binding grasses. In places the valley is deliciously green with crops, which need no irrigation. The road down the Tsangpo—as in 1924, I kept to the right bank—is long and winding, with many detours to cross tributaries. It is surprising that the Tibetans do not make use of their magnificent waterway, which for miles, though swift, is unbroken by rapids and quite fit for boats. Lopas, who come over the mountains to work in the fields, would be available for hauling boats upstream, at any rate during the high-water season. From Lilung to Tsela Dzong, a distance of 60 miles, there is not a single impediment to navigation. One is forced to the conclusion, rather borne out by experience, that there is no serious traffic in the Tsangpo valley.

On July 22 I reached Tsela Dzong, where I stayed three days. Eleven years had brought no change here. I visited some of my old haunts, where in 1924 I had collected many fine plants—a rather melancholy proceeding. I found here the striking yellow-flowered *Morina Coulteriana*, which grows also round Simla. These are not true alpines, but plants which grow at comparatively low altitudes. The main valley for some miles above the Gyamda chu confluence is fully 2 miles wide, and the river, which is extraordinarily placed, corresponds. Even at this season of high water there were islands in midstream, and sand dunes at the confluence. The Tsangpo valley east of Shoka is obviously glaciated; and when looking down it, with the river out of sight, I had the curious illusion that it slopes to the west. From Tsela Dzong I saw the snow cone of the Namcha Barwa over the Temo La range, not often visible at this season. Looking towards the north-east—that is in the direction of the river's course—I was aware of a great arc of snow peaks beginning with Namcha Barwa and its satellites in the south, continuing through Gyala Peri and Markandro and the snow peaks above Lunang, and curving through the great range above Tongkyuk and the Po Yigrong.

Sir Sidney Burrard stated some years ago that there was conclusive evidence that the Tsangpo formerly flowed in the opposite direction, that is from east to west.[1] He based his argument on the number of its tributaries which flow in a direction contrary to the main river, and cited the Kyi chu, Nyang, Rang, and Shang. To these may be added the Kyimdong chu, then unknown. But Burrard did not know quite what to do with his river when he had transferred it to western Tibet. He was anxious to dispose of it through the Himalaya. If however it was a smaller river then than it is now, it may quite easily have lost itself in the Tibet lake basin, then much larger than it is to-day. The difficulty is that if the Tsangpo flowed westwards the Gyamda river must almost certainly have done the same; and though there is no a priori reason why it should not have done so, neither is there any direct proof that it did. The great lake-like expanses of the Tsangpo valley at Pe and at the Gyamda river confluence, the arrangement of the great snow peaks in an arc from north to south, the westward flow of the Namcha Barwa glaciers, and the

[1] 'A Sketch of the Geography and Geology of the Himalaya Mountains, and Tibet,' by Colonel S. G. Burrard, F.R.S., and H. H. Hayden, B.A., F.G.S. (First Edition).

immense gravel terraces and moraines at Kyikar, thinning out westwards, are facts which lend colour to Burrard's theory.

In 1924 from a hill-top near Tsela Dzong I had seen what appeared to be a great range of snow peaks to the north distant perhaps 50 or 60 miles. Later, from another hill-top even better situated, Cawdor and I had obtained an extensive view of this range: for range it certainly was, not a few isolated peaks. We made two attempts to locate it more exactly, in August, and December, but without much success. It happened that the summer of 1924 was unusually wet, and although we caught sight of snow peaks and glaciers from the Nambu La and Pasum Tso, more or less where we supposed the range to be, we were never very sure of its location, extent or direction.[1] I now decided to make another attempt, and took the road to Tumbatse, which had been our base in 1924.

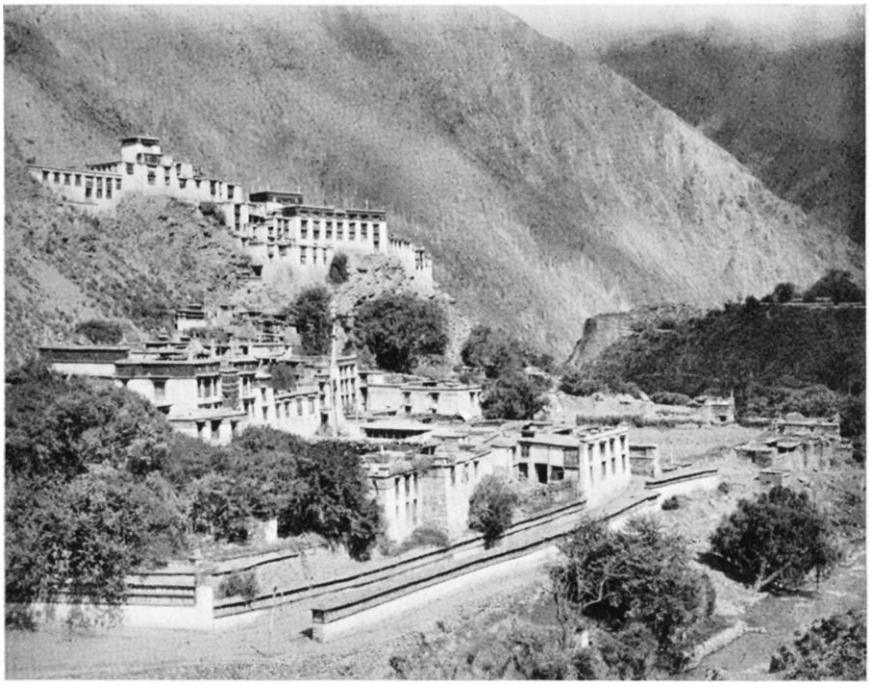
From Temo Gompa I crossed the Temo La in fine weather and from the Rong chu again saw snow peaks to the north, which I reckoned to be not more than 30 or 40 miles distant. As Tongkyuk is almost exactly 20 miles from Tumbatse, I would on arrival there at least be "warm"—as children say. At Tongkyuk I was met by a smart military-looking *dzongpön*, who had arrived from Lhasa only a few days previously on special duty. Formerly, he told me, he had been Chief of the Lhasa Police. He was shortly going to the Po-Yigrong, and when I expressed a wish to go to Showa, he discouraged the idea, saying that Pome at this time of year was an unhealthy place—which was likely. However he said I might go to the Pasum Tso or to the Po-Yigrong if I liked. This was just what I wanted, and after a day's delay at Tongkyuk I started for the Po-Yigrong.

Two years previously the Tongkyuk river had come down in flood, carrying away the road and every bridge, and tearing out the sides of the valley 30 or 40 feet above the normal level. It had not done much damage—Tongkyuk itself is built on a rock, 200 feet above the river—because there is not much here to damage; but it must have been a wonderful sight while it lasted. This district on the edge of Pome is very sparsely populated. The people are not true Poba, nor do they resemble the people of the plateau. They call themselves simply Rongpa (literally, valley-dwellers). While we were here numbers of Kampa pilgrims on their way to Lhasa passed through Tongkyuk. They had come down the Yigrong gorge and over the Sobhe La in order to reach Temo Gompa, working in the fields for a few days at each village through which they passed in order to earn their keep. In the last days of July I started up the Tongkyuk valley with ponies and porters. Two miles above the village of Paka, where a large glacier torrent flows in from the north, we camped at the mouth of a comparatively small stream rushing through a narrow glen, and next day we began the steep ascent through the forest to the Sobhe La. One would have supposed that the wide valley of the Paka chu was the obvious route—indeed I had been told as much in 1924. Actually the Paka chu is blocked at its head by glaciers, and the path up the next valley might easily be missed. Above the forest we came to meadows of tall flowers, amongst which two species of wild onion (*Allium*) were conspicuous. One of these had handsome heads of purple flowers. I had expected to find the

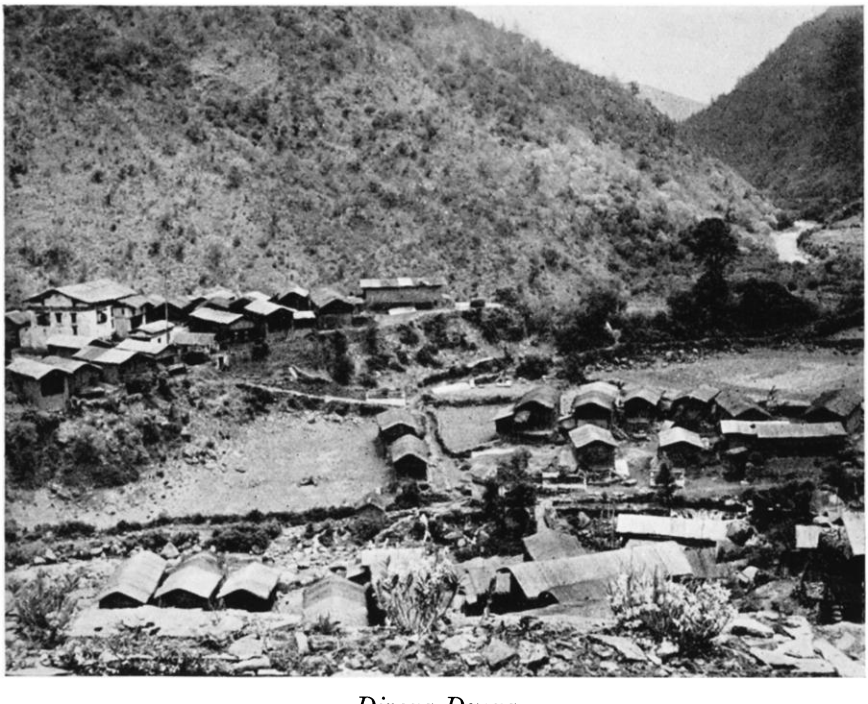
[1] *Geogr. J.*, February 1926.

Tibetan climate suitable to lilies, and hoped there would be many species of those fine plants. Actually there are only two, *Lilium giganteum* and *L. Wardii*. But the peculiar Tibetan alpine climate has helped to evolve two endemic lily-like genera, namely *Notholirion* and *Nomocharis*. Instead of lilies, another genus of bulbous plants, namely *Allium*, shows considerable development in Tibet; and in the course of this journey I found no less than ten species, several of them beautiful plants.

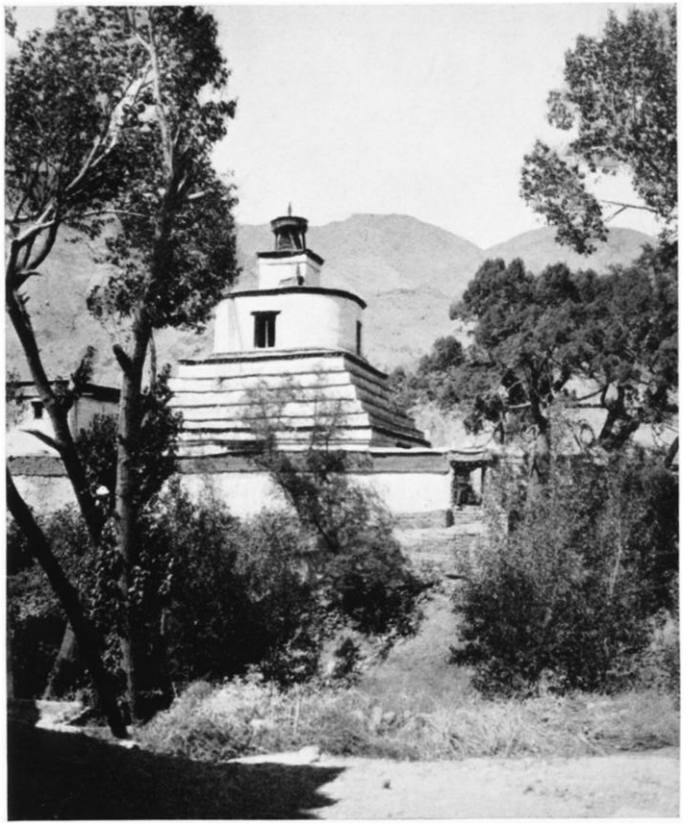
By the afternoon of August 1 we were in a broad glaciated valley, beneath the snow peaks. The last doubt vanished. In front of me was the snow range I had come to seek. Our little camp was girdled by peaks and small hanging glaciers, the farthest 3 or 4 miles distant. The evening was fine, and we could see the pass at the head of the valley, between two snow peaks. The dawn was suspiciously clear, every peak and six glaciers being visible. However I expected to reach the pass within three hours, before the clouds came up. Actually it took us four hours of hard going over moraines; the last few hundred feet were very steep, and before we reached the pass clouds had gathered round the snow peaks. We looked over into a valley full of mist, but the veil lifted momentarily, and through a dark ravine I caught sight of the Po-Yigrong to north-north-east steeped in sunshine, with cultivation on the far side, and two lofty snow peaks beyond that. From here the river looked rather like a lake. The Sobhe La is certainly over 16,000 feet, and is a difficult pass; nevertheless it is much used, especially by pilgrims from Pome on their way to Lhasa during the summer. The south side, as I have said, was steep, but the north side was precipitous, and a hard snow slope at about 70° did not make it easier. A cautious climber would surely have roped his party here; but the Tibetans cheerfully traversed diagonally across the snow face, where pilgrims had already trodden a narrow track, though a slip meant certain death. The descent was more arduous than the ascent had been, and extraordinarily steep for 1000 or 1500 feet. We met a small party of pilgrims on their way up. They prefer this difficult short cut to the two days' journey down the Po-Yigrong, and thence up the Tongkyuk river, in the rainy season. A woman was carrying a tiny baby in a basket on her back! At last the slope eased off on to a grassy shoulder overlooking a deep gulley filled by a glacier from the eastern peak above the Sobhe La. Descending the lower part of the glacier we reached a very boggy meadow into which four glaciers discharged. No less than three alpine Rhododendrons were in full bloom here. On a slight mound in the midst of this marsh was a herd's hut. We squelched through the marsh for half a mile, crossing several quick streams. A large glacier from the western peak almost completely blocked the exit from the marsh, and the combined streams, squeezed between the end of the moraine and the cliffs on the other side, rushed out of the meadow and fell with a roar into the forested valley below. The path continued very steeply down the moraine, now clothed with shrubs. After descending about 1000 feet we crossed to the right bank of the turbulent torrent, and continued the steep descent through Rhododendron and Fir forest. After crossing several glacier torrents we camped at dusk in a clearing where grew sheaves of the beautiful purple lily called *Notholirion campanulatum*, with *Astilbe*, *Rodgersia*, and other big-leafed woodland herbs. We reached the broad valley next day,



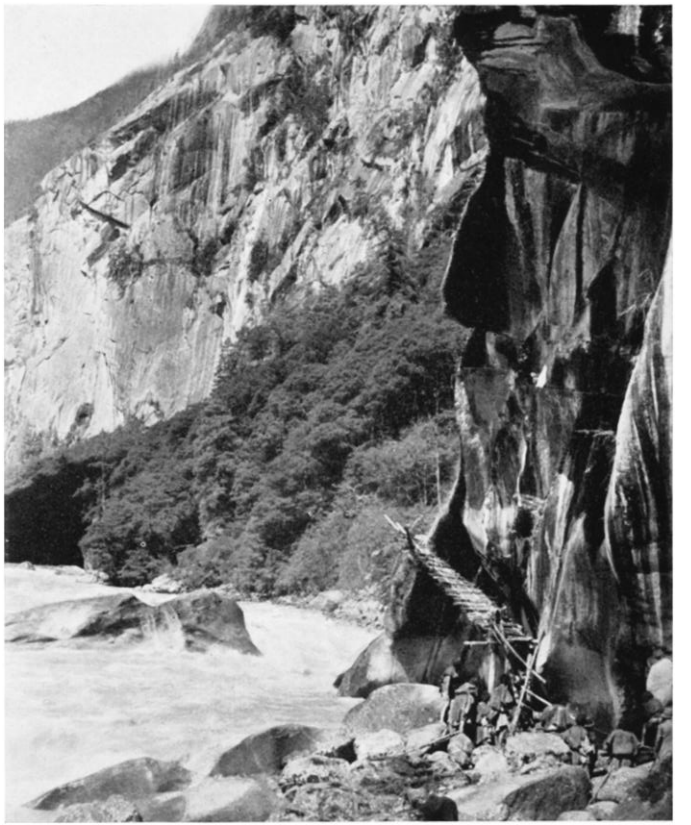
Sanga Chöling



Dirang Dzong



The 'labrang,' Karta



Bridge-building in the gorge of the Yigrong

passing from mixed Conifer to Tsuga forest where epiphytes smothered the trees, and finally to forests of *Pinus excelsa*. This valley or plain, called simply Po-Yigrong,[1] is 3 to 4 miles long, and a mile wide, clearly a filled-up glacier lake basin. We turned west and halted at the village of Temo Chamna, close to the river. On the left bank are several villages and a *dzong* called Tongbe, but no *dzongpön*, the district being under Tongkyuk. At the head of the plain is a small monastery, Samling Gompa. The size and speed of the river surprised me. It flows from west-north-west almost due east for about a mile, then turns more to the south; the south-east end of the plain was hidden from view by a spur. At the north-west end a large tributary enters, flowing through a gorge from a group of snow peaks. The plain is in fact enclosed by snow mountains, the glaciers from the northern range being visible from Temo Chamna, as those around the Sobhe La would be from the other bank; only the view from there would be even finer. What a magnificent base this plain would make for a well-equipped expedition to explore thoroughly the difficult and mysterious Po country!

To the north, a group of high bare granite peaks like those seen from Shugden Gompa in 1933 was conspicuous; and towards the south-west was a similar group, continuing the range in that direction; but these are only outliers of the great snow range. The fact that there are snow peaks, or rather a snow range, on both sides of the Po-Yigrong, suggests the possibility that we are really dealing with two distinct ranges. I can hardly believe that the Po-Yigrong has cut a 100-mile gorge diagonally across a single axis. If Namcha Barwa and Gyala Peri stand on separate ranges, as they must unless we believe the Tsangpo has cut a diagonal gorge across the Himalayan axis, the snow peaks N. and S. of the Po-Yigrong also do so. The main range with the highest peaks certainly lies south of the river. Nevertheless there is a chain of snow peaks parallel to, and north of the river also; and while it is permissible to make suggestions as a result of what I saw, obviously no final pronouncement on so intricate a problem can be expected as the result of a rapid pioneer journey. The river was strewn with dead timber, whole trees sticking up out of the sandy bottom. Several short coracle-like dugouts were drawn up on the bank, and fishing nets were spread out to dry. Whenever a big flood comes down part of the plain, more particularly on the flat right bank, is inundated. It was now under crops however and the corn was already ripe. The altitude of Po-Yigrong cannot be much over 7000 feet, and the temperature in my tent at 4 p.m. was still 77° F. Cattle are kept.

On August 4 we started up the Po-Yigrong, and crossing a very large torrent, we quickly reached the end of cultivation. Ascending a pine-covered moraine we entered a deep forested gorge. Almost immediately we began to climb, and from this point to Talu we caught only an occasional glimpse of the river. But we heard it. When we did see it, it was a furious mass of foam;

[1] The Po Yigrong was discovered by Bailey and Morshead in 1913. Earlier maps of the Tsangpo bend based on Kinthup's journey, though showing a possible Po-Yigrong, are so inaccurate that the river can hardly be said to exist. Being unable to cross it at its junction with the Po-Tsangpo, they marched two days up the right bank and crossed it at the southern end of the same plain which I reached at its northern end. I heard it always called Yigoong, or Yigung, though occasionally the "r" was just sounded. Naturally, I have not altered Bailey's spelling.

there appear to be vertical falls, though of no great height, between Talu and the plain. The walls of the gorge are absolutely sheer, and on the north side many hundred of feet high. We passed through forests of magnificent oaks and other broad-leaved trees, with Tsuga and a big tree Rhododendron as we got higher. The next two nights we camped by large glacier torrents which came rushing in from the south-west, and therefore had their sources near the Sobhe La. I had caught a glimpse of snow peaks in this direction from Temo Chamna, but the fact that three great torrents entered the Yigrong within a few miles of one another indicates that there is a group of big peaks just west of the pass. Two high-level terraces afforded good camping grounds by the torrent the first night; but the thick forest which covered them made it very confusing to remember which terrace was which, and wandering away from the camp I had some difficulty in finding it again. On the third morning we stood on a cliff and looked down on another opening in the valley, with intermittent cultivation for over a mile on the left bank, and three villages, numbering at least fifty wooden houses. Below us a rope bridge spanned the river. The crossing took some time. Had the river been a foot higher we could not have crossed at all. Even here the current was running at a good 10 knots. We continued a short distance up the left bank and halted at the village of Talu. The whole valley with its three villages (there are few houses on the right bank) is called Tage. The weather was wet and cloudy and I was not sorry to halt here for a day while porters were being collected for the next lap.

On August 8 we continued our journey, soon reaching the head of the valley and plunging once more into a forested gorge. Just before entering the gorge we crossed a big stream from a snow peak called Tamchokpa to the north-west; there is a village of the same name a day's journey up the valley, but no through route. We now began to see snow peaks on both sides of us quite close, and presently we passed a steep glacier on the right bank, whose foot was within about 1500 feet of the river. The forest here was composed almost entirely of Pines (*P. excelsa* and *P. tabulaeformis*) and Rhododendron; but on the sheltered side Tsuga was also common. About 4 miles from Talu we reached the small village of Ba, above which the river, making an S bend between snow peaks, again becomes turbulent. That night we camped at the foot of a great water-worn granite cliff, where the river was in frantic turmoil, leaping down a steeply sloping bed choked with huge boulders.

The next day's march was not unlike that of the previous day; but in the evening we reached a small village opposite a glacier. The pine forest suggested that we might be approaching a drier region, and certainly I had no reason to grumble at the weather, as we had almost as many fine days as wet ones. But here I found *Rhododendron megacalyx*, which is rather indicative of a wetter climate. The flora was indeed very rich, and the great number of species kept me fully occupied. It is a fact of considerable interest that the flora of the southern Himalayan slopes in the Simla region and farther north-west, crosses the great range somewhere to the west of Sikkim, to reappear on the northern Himalayan slopes in Eastern Tibet. Not only so, but this same flora spreads north of the Tsangpo, and is found on the range I was now exploring. Eastwards it extends into the mountains of China.

August 10 was wet and we did not get very far. First to a small village called

Boyu, where we changed porters; then on to a larger village called Shonggyi, at the junction of a big stream from the north. Shonggyi stands opposite to a fine snow peak and glacier nearly due south which descends very close to the river. The north valley is strewn with large erratics, and up it I could see snow peaks and glaciers. The snow peaks north of the river are farther away than those to the south, and the glaciers have retreated farther. The gorge of the Po-Yigrong seems to be entirely water eroded; it shows no evidence of ice action, but the lake beds of Yigrong and Tage are proof that at any rate glaciers reached the main valley from both sides. They may have flowed down it. The river is degrading its bed very rapidly on the steep pitches between the levels, and we passed bare granite cliffs, now high and dry and under gravel and conglomerate beds which at no remote date must have been scoured by it. Obviously all traces of ice action would quickly be worn away. One pictures a chain of lakes connected by falls or steep rapids flowing from the ends of glaciers, like the Pasum Tso lake chain, part of which still persists.

Next day after a short march through a gorge staggered like a sap, and a long climb up to a shoulder, we reached the big village of Ragoonka on a sloping terrace, which undoubtedly marks the level of an older glacier valley. The shoulder is an ice shelf left intact by the river while cutting its bed through the old glacier floor. A small hanging glacier on the rocky range to the north just above the village emphasized this. To south and west the view was very different. Here were great snow peaks rising from the depths of the gorge. The highest peaks and largest glaciers lay to the south. The river makes a sharp bend round the spur on which Ragoonka is built, and is joined from the south by a stream flowing in a very deep gorge between the snow peaks. At the head of this valley is the Ba La, beyond which lies the Pasum Tso. The Ba La therefore crosses the main range; and from Ragoonka to the Pasum Tso is five marches. Both gorges, especially that of the Po-Yigrong, looked absolutely impassable from above. Ragoonka is an important place. The well-built houses, some eighty in number, of timber on stone foundations, stand at the top of the sloping shoulder amongst tiers of cornfields. At the foot of the slope is a wide cultivated terrace, bounded by the river cliffs. I counted a hundred people working in the cornfields, and the total population must be about four hundred. I stayed in a leaky room, one of several round the courtyard of a small decayed monastery. Five soldiers, who had been ordered down river to meet the *dzongpön*, called on me. They were fine upstanding men armed with neglected pre-war rifles. The weather had turned wet and the snow peaks were for the most part hidden in cloud. When we started westwards again on August 13 the rain had ceased. I noticed that the Ragoonka porters carried axes and long coils of new yak-hair rope, and we took on three extra men. Descending very steeply the opposite side of the spur, we reached the river once more and travelled along the bank beneath high cliffs. Glaciers from the southern range petered out only a few hundred feet above the river, and a snow bed in a gully actually reached the water. Under the glaciers the rapids were fiercer than ever. From a spur I had a good view down the gorge to a snow peak opposite Ragoonka. After marching about 7 miles in six hours we camped on a grassy flat beneath high bare granite cliffs. The next day's march began with a stiff climb up the cliff for

1000 feet or more, followed by an awkward descent down ladders (notched poles) and rough going over boulder slopes to the river again. But the gorge was growing ever narrower and steeper, and we soon had to climb again. Now came a very awkward traverse across a smooth granite face, which immediately below fell sheer to the river. How the six round holes had been ground in the hard rock I could not imagine; they would take one's toes, no more, the rest was balance. To a non-climber it was giddy work watching the porters with 40-lb. loads on their backs step nonchalantly across leaning very slightly inwards; giddier work crossing oneself, even with the adventitious aid of a rope! Towards evening we reached the most formidable part of the gorge. The cliffs towered up for thousands of feet, till scarcely any sky could be seen, and they were very bare. There seemed no way either through or over. The rapids were tremendous, and the thunder of them filled the gorge, echoing from cliff to cliff. A hidden path zigzagged up a cleft in the rock, behind a dense screen of bamboo; it brought us to a dizzy gallery built round the face of a buttress. Again I marvelled at the ingenuity of the primitive workmen who had engineered this remarkable road: it was like a scenic railway at a fun city—without the fun. The gallery (of timber) continued for 300 feet, tacked on to a bare vertical cliff, and then we reached firm rock again well inside the portals of this amazing gorge. Two possibilities were now open to us. We could descend to the river again, and if the water was sufficiently low, clamber round the scalloped cliffs by means of a "bridge"; or we could leave the gorge by continuing the climb for some thousands of feet, crossing the mountains, and descending to another river. The latter route was said to be longer by a day; but as the bridge referred to would probably need a good deal of repairing, if not rebuilding, there might be little in it. We decided to examine the river first, and descending once more, we reached the water's edge. The scene was certainly awe-inspiring even for this part of Tibet, where that adjective is apt to be overworked. I could plainly see the tilt of the river bed for some distance; it was like looking uphill. Only at intervals the gradient was broken by an escarpment, or the whaleback of a projecting rock over which the vast volume of water just dropped with a thud, or rose and leapt, or poured round in two girdling streams, as though forced from a hose pipe. Immediately in front rose the overhanging cliff, against which surged great waves. A wooden gallery sloped up the face and disappeared round a corner; the lower end of it hung 12 feet above the water-level, and was reached by a notched log, lashed to some staging. But the staging itself was 30 or 40 feet from where we stood on safe ground, with heaving deep water between. The rest of the bridge had been washed away. We camped close by, cutting out a nest in a dense growth of bamboos, and that evening the Tibetans spun a 100-foot rope of split bamboo. Early next day the bridge building began. Whole trees were felled and by midday we had crossed the gap on sticks, and reached the gallery. Round the corner we found a bay beneath us, the water heaving waist deep against the cliff. Now the bamboo rope came in. Two men crossed the bay with the end of the rope, fastened it to a pole driven into the ground, and men and loads slid down the improvised rope bridge. During the last hours of daylight we made better progress, still hemmed in by huge cliffs, but keeping close to the river. Presently we turned

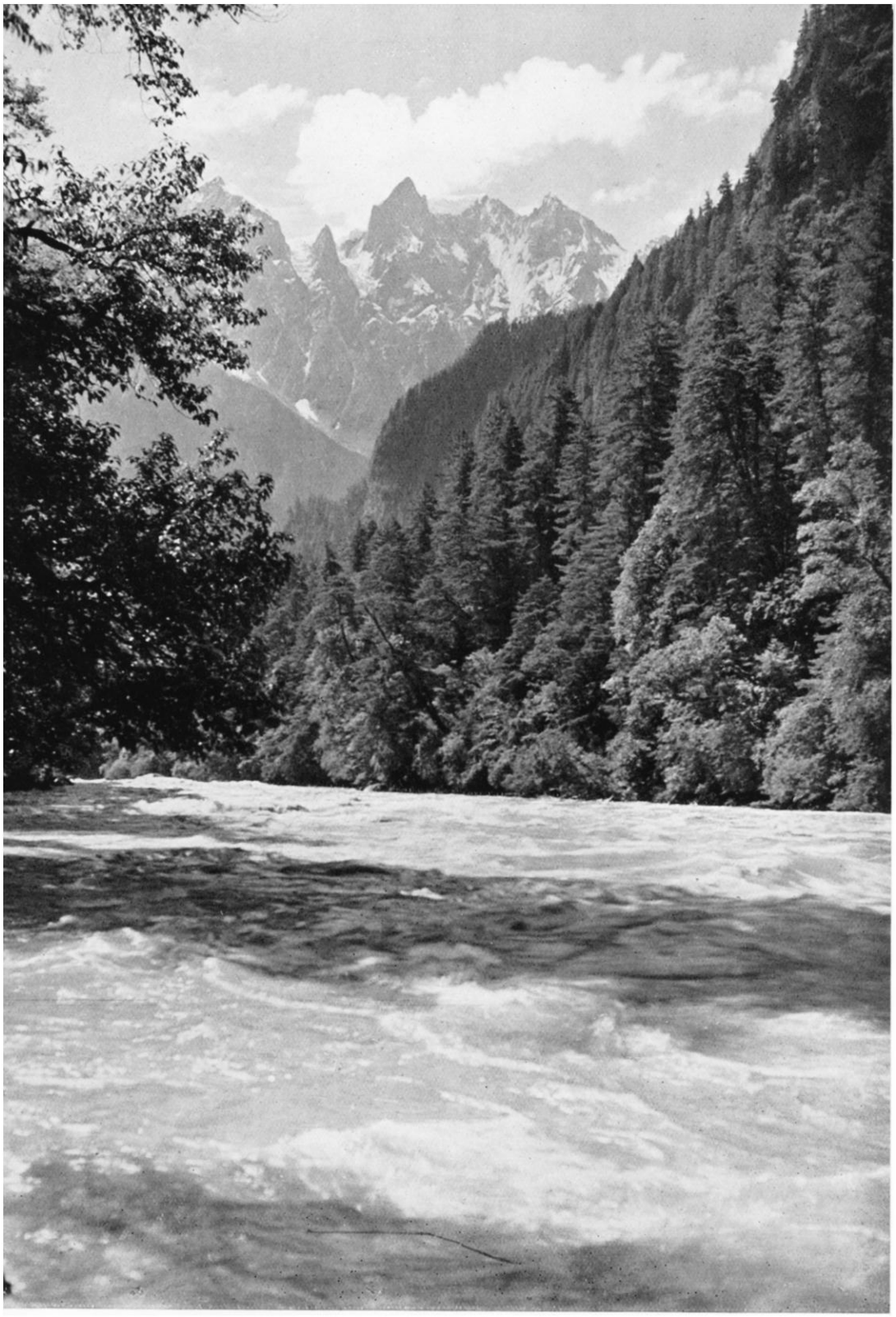
abruptly north-west, with snow peaks visible to the south-west at the angle again, climbed high up a cliff above violent rapids, and descended to a broad arid valley. The river, now 80 yards wide, flowed tranquilly but swiftly. The contrast was complete: we were out of the gorge. Ahead of us the high, bare granite mountains and wide flat valley, with sand banks dividing the river, were typical of dry Tibet; the wind was both dry and hot. The altitude would be 11,000 or 12,000 feet, not more. I found a striped toad (*Bufo viridis*) in a thicket here. Behind us the river plunged steeply into the bowels of the mountains. Next day we soon reached a rope bridge, and crossing to the right bank presently reached Nyo (Nyöme). Just above the rope bridge, from a deep slit in the mountains on the left bank, the Alado chu peacefully enters the Po-Yigrong from the east; a snow peak was visible.

Had we crossed the mountains from the lower end of the gorge we should have descended to the Alado chu. There is a road up this river which, after crossing the Alado La, joins the Gyalam at Lharigo Dzong. Another road to the west, the one we followed, joins the Gyalam at Laru, a few miles north of Gyamda. The Kampa pilgrims we met at Tongkyuk had come this way from Kam. There is no road northwards other than that up the Alado chu. It is now evident why the Gyalam between Gyamda and Alado makes its big northward arc: namely, to miss the difficult Po-Yigrong country. The chord made by the Laru–Nyo–Alado route is not exactly a short cut, but is certainly used both by traders and pilgrims, as is the route down the Yigrong gorge itself. Nye is a considerable but scattered village, at the west end of a mile-wide cultivated valley, 2 or 3 miles long. There are several villages on both banks, joined by a wooden bridge. The valley is dry and hot, all crops being irrigated—though it poured with rain while I was there. The large houses are built of stone, with wooden roofs, and there is the usual stone-flagged courtyard, surrounded by noisome rooms in which the workers live. I spent the night in the little monastery. Between Temo Chamna and the end of the Yigrong gorge below Nye, the river receives eleven large tributaries on the right, or south bank, but only eight on the left or north bank. The southern or south-western tributaries are for the most part larger than the northern tributaries, proving that here at any rate the main portion of the snow range lies to the south of the river. In this stretch I saw only three rope bridges, including the one at Tage. The first cantilever bridge is at Nye.

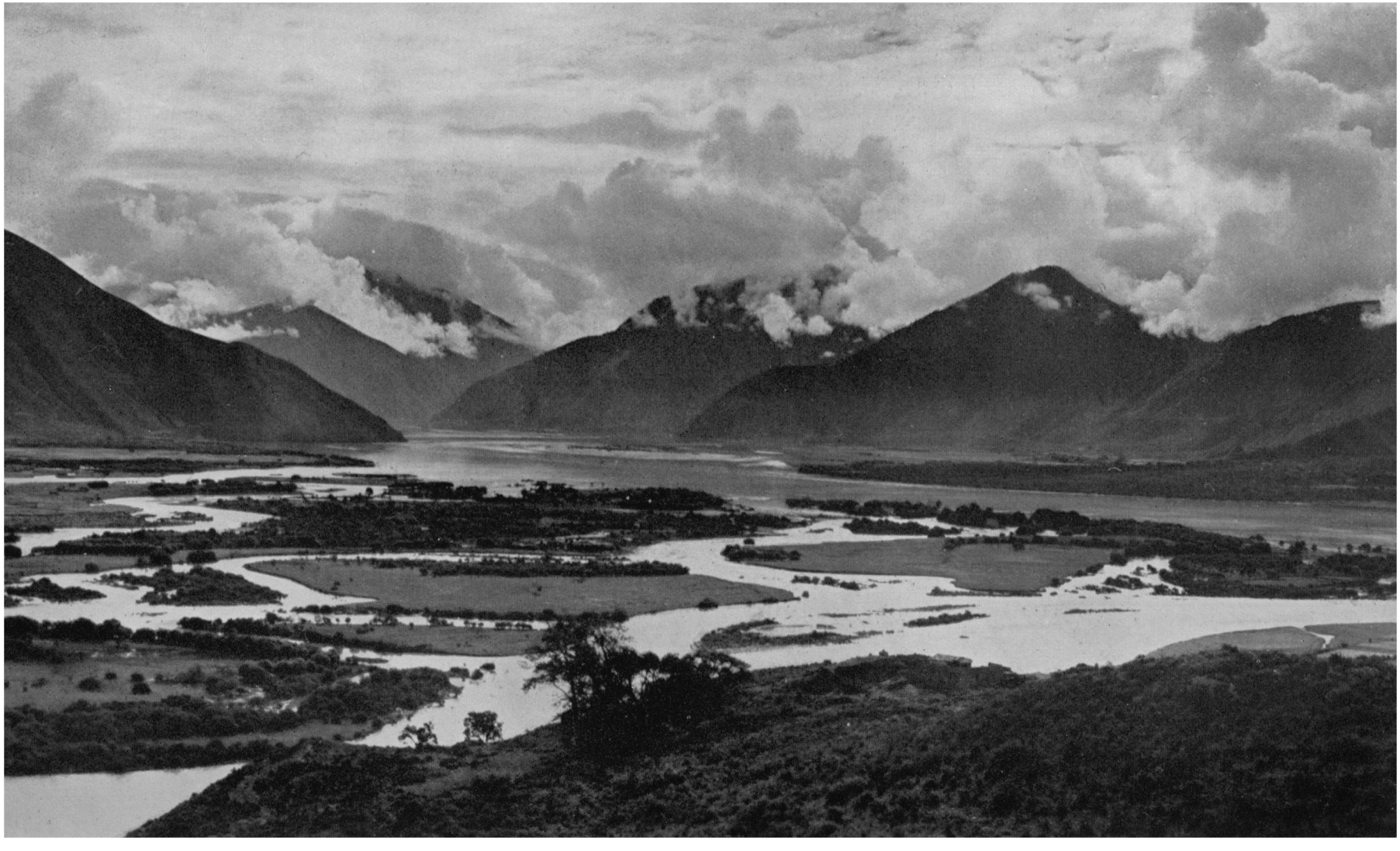
Above Nyöme the Po-Yigrong (now called Nyo chu) becomes an ordinary boisterous mountain torrent, rushing between forested mountains. The dryness of Nye is due to local wind; there is plenty of rain in the neighbourhood. Squirrels are common in the mixed forest which fills the valley above Nyöme. The path is rough. Passing through the villages of Tor, and Kongma (where we slept) we reached Nyotö Sama at midday on August 18, and again the valley completely changed its appearance. For the last time it widened out, the forest ended, and the river meandered through flat meadows. The plain was about 2 miles long, and contained several clusters of stone houses with wooden roofs. One village on the right bank of the river stood at the foot of a steep terminal moraine, now covered with trees; the glacier above descended to within half a mile of the plain. But the finest sight of all was the great glacier which descended into the main valley from the south, completely

blocking it. Below the glacier foot was a small lake. That this glacier, reinforced by lateral glaciers, had reached the end of the plain in recent times—probably a few centuries ago—was obvious. Even the terminal moraine at Nyotö Sama which had held up the original lake, was still visible. Thus the Po-Yigrong displays a chain of four basins threaded on a narrow gorge. The topmost basin still contains a glacier, above which is a typical alpine valley with more glaciers at its head. There can be no doubt that the basins are lake basins, and that each one of them contained a glacier at no remote date; probably these glaciers remained stationary for a considerable time and represented the last phase of the glacial period before the final (present) retreat set in. The question then arises: was the entire Po-Yigrong gorge occupied by a glacier some 75 miles long? From what I saw at Ragoonka and Shonggyi, I am of opinion that it was, though as I have already remarked the gorge shows no visible sign of ice action. In this connection however the following points must be borne in mind. The present rate of retreat of the glaciers, whatever it may be, is no measure of the past rate. The larger the glacier, and certainly the lower down it was, the faster it disappeared when once the retreat was sounded. There has probably been a progressive slowing down of the retreat. The alpine valleys would retain their glacial shape and glacial remains long after the lower valley had lost both; and that for three reasons: (1) the alpine valleys are protected by snow, and by the freezing of the streams for six months in every year. (2) They were of course the last to lose their glaciers, which have not yet disappeared. (3) There is no forest, which has a conservative effect and certainly helps to mask the debris of glaciers. Add to this that the links between the chain of lakes are the steepest pitches, and the rushing torrent does the rest. It is obvious that the gorge must quickly take on a water-worn look. Travelling up the valley past a monastery perched on a spur, past two cascades falling from hanging glaciers over the boundary cliffs of the overdeepened valley, we came almost to the foot of the great glacier, and started to climb above it by a very steep path. When overlooking the glacier foot we traversed for some miles, emerging at dusk into a meadow, opposite the point where the glacier poured into the main valley from a constellation of magnificent peaks. It had begun to rain, and clouds blotted out the view. A wall of séracs marked the flank of the glacier, and we looked on to a tumbled sea of ice rising steeply in front of us and passing out of sight below. The glacier then descended 1000 feet or more into the valley we had just left. We were behind it; and the river passed right under it. Above the glacier herdsmen tended their flocks in the wide wet pastures.

Next day we continued up the valley, past several herds. In the afternoon we camped beyond the highest tents at the foot of the Lochen La, and 6 or 8 miles above the great glacier. At this point we could ford the Po-Yigrong, which had its source in another large glacier less than 2 miles distant. The head of the valley is in fact clasped by a ring of ice. One glacier reaches the floor of the main valley, and flows lopsidedly down it for a mile; several smaller glaciers stuck on the cliffs above converge on it in a semicircle. Behind these rise a group of terrific sharp peaks. Thus I had reached the source of the Po-Yigrong; but apart from that I had only a rough idea of my whereabouts; nor would any existing map of this part of Tibet have helped me, though I



The gorge of the Yigrong: great snow range in background



regretted not having with me a copy of the reconnaissance survey we had made in 1924. That would have told me a good deal, as I was to discover two days later.

The ascent out of the valley to the Lochen La is steep, the last few hundred feet over bare rock; close to the pass a small detached glacier is fast dwindling to a mere snow bed. I climbed to a peak above the pass commanding a view all round, but a blizzard of snow blowing up from the other side rather spoilt things. A low stone wall had been built across the saddle to protect travellers caught as we were. Beyond the glaciated Po-Yigrong valley far away in the east I saw snow-covered mountains buried in yeasty clouds. The highest visible peak, perhaps 23,000 feet, was not more than 2 or 3 miles distant to the north-west. The view southwards and westwards from the pass was restricted. We descended by a series of abrupt steps into larger and larger glaciated valleys, first south then west, then south again, and finally west; at the head of each valley were snow peaks and glaciers.

When we resumed the descent on August 21 we quickly reached a valley which looked vaguely familiar, and turned upstream north-westwards. A horseman who accompanied us from camp turned down the valley bound for Shoga Dzong. This then was the valley Cawdor and I had come up from Drukla Gompa in 1924; we had crossed the Pasum Kye La at its head, and reached the Atsa Tso, on the Gyalam. The topography of the region now becomes clearer. The Pasum Kye La crosses the Po-Yigrong range just west of the source of the Po-Yigrong. I had already suggested that the stream which flows eastwards from the Atsa Tso is the source of the Po-Yigrong. This proves to be incorrect, though it is quite possible and even probable that this stream joins the Po-Yigrong lower down.[1] Nor is the Po-Yigrong range here the watershed between the Salween and Tsangpo systems. We did no more than cross our track of 1924, ascending westwards to a hanging valley. In pouring rain we camped above the tree line at about 15,000 feet.

On August 22 we crossed the Tse La over a rocky ridge; this pass and the Lochen La are both about 17,000 feet. From the top I observed snow peaks and glaciers to east and north-west, quite close. We descended into a fairly broad valley, occupied as usual by herds. Next day we reached a village—Nyemna—and shortly after the Gyalam at Laru, through which we had passed on our way from Atsa to Gyamda in 1924. I was now convinced from the snow peaks which formed the northern flank of the valley above Laru, that the Po-Yigrong range extended westwards, north of Gyamda; though this requires further confirmation. Hence the Gyalam must cross it on the way to Atsa as shown on our map of 1924. There are certainly snow peaks immediately west of the Laru–Gyamda road, as well as immediately to the south-west of Gyamda; and all these peaks may lie on the one great range. Gyamda had not altered for the better in eleven years. The one shop it then boasted—kept by a Chinaman, had closed down; but a new bridge has been built over the river. I could buy nothing in Gyamda itself; but at this season big Lhasa-bound caravans from eastern Tibet pass through almost daily, and we bought

[1] The tributary which joins the Po-Yigrong at Nyöme from the west may be this stream; or possibly it is the large stream from the north-west which enters the plain at Temo Chamna.

Confluence of the Gyamda chu with the Tsangpo at Tsela Dzong

some brick tea. We now enjoyed several days of fine sunny weather, though I was sorry it had not come while we were on the passes.

There are two direct routes from Gyamda to Takpo and Tsari followed by traders and pilgrims, one *via* the Sho La, the other a little farther west *via* the Ashang Kang La. I chose the latter. On August 28 I started westwards again up the valley of the Gyamda chu, and when a few miles out on the Lhasa road, observed a snow peak on the range to the south of us. The valley however is deep, and I could see nothing of any snow peaks to the north, though the fact that we crossed two big tributaries flowing from that direction indicated the presence of a high range. The granite so conspicuous round Gyamda was now replaced by metamorphics, perhaps due to contact between the igneous rocks of the Po-Yigrong range and the sedimentary rocks of the Lhasa region.

For two days we followed the road to Lhasa through a broad well-wooded valley, the stony river terraces, which are very conspicuous, affording little opportunity either for grazing or cultivation. On the third day we turned abruptly south up a wide valley to a small village called De. Continuing a few miles above the village, we camped with the herds on a grassy plain.

A long march up the valley, almost due south, on the last day of August brought us at dusk to the highest camp. There were snow peaks and glaciers both to north and south, but they are not above 20,000 feet altitude. On September 1 we crossed the Ashang Kang La, a high bare saddle covered with loose rocks of arkose. Just below the pass on the north side the valley divides; and the more westerly branch crosses the range by another pass, the Gechi La, which leads into the Chögorche valley. I had intended to follow this route in order to visit the "rainbow" lake above Chögorche, mentioned by A. K.; but hearing that the ministers of Tibet were in summer residence at Chögorche, I altered my course.

From the Ashang Kang La I looked down a long ice-worn valley enclosed by high sierra-like ridges; there was a small lake at its head. The scenery was grim. We camped again with the herds, and next day before continuing our journey towards the Tsangpo, visited a sacred lake called Gaylam Tso, in a hanging valley. This is a place of pilgrimage, and some of the Lhasa ministers had visited it from Chögorche only the previous month, and set up a shrine flanked by tall poles at one end of the lake. It is an ordinary glacier lake. A long march down the alpine valley nearly due east, brought us into a larger glaciated valley, with signs of cultivation, and again we turned south. It was dark when we reached the wretched village of Nye, where I rested a day. There were numerous Tibetan hill partridges here (*Perdix hodgsoniae*), a bird common in the scrub-covered alpine valleys of south-eastern Tibet.

On September 4 we marched south and south-west down the narrow wooded valley between high granite cliffs. The gradient was irregular, rapids alternating with quiet lake-like expanses, where drowned trees were conspicuous. The path was overgrown and apparently not much used, but we had no climbing. Having covered about 15 miles in ten hours, we reached a small village, Sham, at dusk. There are houses on both sides of the river. Here the high scarped cliffs were definitely forested with Pine. A few hours' march next day brought us to the Tsangpo valley opposite Tromda, whence the Takpo road continues up a valley to Guru Namgye Dzong. The rock

had changed abruptly again from granite to metamorphic, and there were no trees, except in the villages; but the dryness was confined to the main valley and its immediate precincts. An almost forest climate prevails within 2 miles of the river on either side. Fifty miles downstream the outer plateau passes definitely into the river gorge region, forest growing actually by the river.[1] But just here the Tsangpo valley itself is still arid, owing to the fierce winds which scour it. Sand hills—they are hardly dunes, often only high sand slopes—occur frequently and support a characteristic flora. All crops are irrigated. The river winds its way through the hills almost as though it were crossing a flood plain; but the current is swift. A sudden furious squall assailed us with rain, lightning and wind of gale force. It passed on down the valley, and within an hour all was peaceful again. We crossed the river in a sort of wooden box, sculled by one man, and reached Tromda on the ninth day from Gyamda. Here I was compelled by sickness to rest two days. Hares abound in the thorn scrub which covers much of the flat sandy bank; and I saw big fish leaping in the muddy river.

On September 8 we set out again, travelling up a stream from the south, and passing the picturesque little monastery of Ganden Rapden sunk in a welter of unsavoury hovels, ended the short day's march at Guru Namgye Dzong, about 6 miles from the Tsangpo. The original *dzong* was superbly sited on a spur rising abruptly from the narrow valley. It is now in ruins, and the modern *dzong* stands by the stream. Paper is made here from the bark of a shrub said to come from farther west, though what shrub would grow on the dry plateau farther west and not here (even if no one took the least trouble to cultivate it) it is difficult to imagine. Guru Namgye Dzong, though a tiny place, has some status: it controls the Tsari valley, which has no *dzong* of its own.

Our next march was a longer one, up the dry, but not arid, valley to the last herdsmen's village of stone houses. There was no cultivation. The weather had turned cold, and it was bleak here at about 14,000 feet, with snow on the range ahead. On the way we passed the quaint little monastery of Boomda Semung. By taking this route we had to cross two passes in order to reach Sanga Chöling; but the Kongma La and the Cha La (previously crossed on July 1) are very close together and on the same range; we should have crossed them both in one day had I not turned down the Tsari valley in order to revisit Chösam. However there was an alternative route to Sanga Chöling, crossing only one pass, the Karpo Ra La: in other words a single-fold range separates the Char chu from the Tsangpo, and our having to cross the Bimbi La in order to reach the Tsangpo from Tsari does not vitiate the fact. The Bimbi La crosses a spur, not the main range; we were already over the northern fold range when we reached the Tsari valley after crossing the Cha La, in July.

The Kongma La, 17,520 feet, is an easy pass. It had previously been crossed by Bailey and Morshead in 1913. Very heavy rain greeted us on the other side, and it was a wet, cold, and tired party that reached Chösam at dusk. I did a day's botanizing here, and then crossed the Rip La over the Takpo

[1] See "A Sketch of the Botany and Geography of Tibet," *Journal of the Linnean Society*, September 1935.

Shiri range—part of the northern fold range just referred to. Here I was amongst glaciers and deeply ice-graved valleys again. At the village of Yüto—one occupied and two empty houses where pilgrims put up—we spent the night before crossing the rather formidable Takar La, about 17,000 feet and steep on both sides. Descending from the Takar La we reached the valley below the Cha La, where we had camped on June 30. There were more alpine flowers here now than in June, and the banks were blue with Gentians and *Cyananthus*. Next day we arrived back at Sanga Chöling. Only the southern fold range now separated me from my base at Chayul Dzong. The ordinary route is over the Le La, a three-days' journey. I decided to cross the unknown Mo La, taking four days.

Travelling westwards a short day's journey up the dry Char chu valley, we reached the small village of Bung. Here we crossed to the right bank, and turning up a well-wooded side valley, where we saw Harman's pheasants, we ascended glacier-worn rocks and high screes to the Mo La about 17,000 feet. The valley divides below, the other branch leading to the Dongyu La, an alternative pass to the Nye chu. On the screes we saw a number of Himalayan Snow-cock (*Tetragallus himalayensis*). These birds when frightened run up hill, calling shrilly, then suddenly rise and plane very fast down into the valley below. In summer at least they are not found below 15,000 feet, keeping to the apparently bare screes and jagged ridges. Right on the Mo La a sudden snow squall blinded us for a few minutes. The view to the north was restricted by the nearness of the northern fold range, but far away to the south-west the Assam Himalaya rose into view. In the foreground a snow bed nestled against a high rock peak, but I could see no glaciers. The slate rocks were highly contorted.

A long march down the narrowing valley brought us at nightfall to a large village with scores of narrow cultivated terraces on both banks of the river. Daylight—a bright sunny morning—showed Dikiling to be a prosperous-looking village situated in an arid valley at about 13,000 feet. We soon reached the Nye chu, a western tributary of the Loro chu. It is a muddy river with a rapid stream. The hot valley is extensively cultivated, with numerous small villages perched up on the gravel cliffs. Though the houses were poor looking, almost every village boasted a fine monastery or at least a *chorten*. The outstanding example is Shangtze Gompa. Above this point is the district of Nye, below that of Chayul. The Nye chu is a typical treeless plateau valley, with river terraces cut in the flanks, and miles of irrigation channels. We turned eastwards down the river, presently reaching Potung Yangze. The contrast between the wretched hovels which comprise the village, situated in a grove of hoary old poplars of great bulk, and the splendid monastery astride the sharp ridge which overlooks it, is extreme. A torrent comes tumbling down here; up it is the route to the aforementioned Dongyu La.

The valley of the Nye chu now changes its appearance, growing narrower and rapidly steeper as it turns abruptly south. Here it is cutting its way across the strike of the strata, and also across part of the southern fold range. The path became more difficult and the last march proved arduous. Towards evening, having descended many hundred feet, we reached the Loro chu, and shortly afterwards Chayul Dzong; the country was even barer and more

scorched than at the end of June, in spite of such summer rain as it had received. Evidently the drying effect of the wind had more than compensated for any rain. I had been absent just ninety days, and had covered roughly 800 miles mostly through unexplored country, and in regions which hitherto had been a closed book to the botanist. My botanical collection numbered about six hundred species, chiefly alpines.

Resting only a few days to pack my collection, I started back for India on September 27, retracing my steps to Karta. I had a little difficulty in getting transport, and it was October 3 before we were able to leave Cha, a small village above Karta. The weather was brilliant, the sky cloudless, but I was hardly prepared so early in the winter for the low temperatures we experienced. At three o'clock in the afternoon we crossed the Pen La, and met a bitter wind. We had to camp at nearly 16,000 feet, and though the wind died down in the night, the temperature inside my tent at dawn was 16° below freezing-point. However on the following day we crossed the Tulung La, and were over the Great Himalaya. From the Tulung La I observed a snow range to the north-west in the direction of Tsona Dzong. Immediately east of the pass is a ring of snow peaks, about 19,000 feet high, with squat glaciers which formerly descended far down the valley. Cold as it was there were pheasants calling from the screes at 15,000 feet. We reached Mago on the 5th, the herds were just leaving Chunak. I decided to return to Dirang Dzong by the so-called main road. After crossing the Chera La above Mago (whence Gori Chen, 21,450 feet, was visible) we continued up the Gorjo chu and next day crossed the easy Tse La, 15,550 feet. The Gorjo chu, which below the Chera La is a boisterous torrent, flows peacefully in a wide glaciated valley higher up. The southern slopes of the range are steep. Passing two small glacier lakes we soon reached a stream lined with rhododendron and deciduous shrubs. Camp was pitched on the fringe of the fir forest, at a regular halting stage. After a white frost which curled and stiffened the leaves of the rhododendrons, we climbed steadily to another pass, the Pang La, which brought us on to a ridge. At the southern end of the ridge was the Poshing La and a cruel descent for the yak, down a gigantic and disrupted stone stairway. A freezing mist made things more unpleasant. The steep descent continued until we were well into the forested Himalaya, when we camped on an open shoulder, commanding a magnificent panorama to the south and west. On October 11 we reached the first residential area since leaving Mago: a miserable monastery called Lagam. Continuing the descent towards the western branch of the Bhareli, we arrived at Tembang, a large Mönba village, after dark.

Another long march on the fifth day out from Mago brought us to Dirang Dzong. It seemed very hot down here after the cold of Tibet. From Dirang Dzong I retraced my steps over the Manda La and two lower passes to Shergaon. Travel throughout the pine-clad minor valleys of the Assam Himalaya was easy even in the middle of October, and the country was so dry it might have had no rain for weeks. Shergaon was warm by day but we had frost at night. I learnt that it was impossible to cross the Pankim La for two months, so I turned eastwards towards the Bhareli, reaching Rupa on the second day. Just above Rupa the stream breaks through a gorge of crystalline limestone (dolomite), where a distinct flora prevails. A beautiful

slipper orchid (*Cypripedium*) was in flower on the cliffs. *Cupressus torulosa*, a somewhat rare Himalayan conifer, not known east of Nepal until Dr. N. L. Bor, I.F.S., discovered it here a few years ago, was scattered about, and several other plants caught my attention. From Rupa I continued eastwards to the Koyutsum village of Jamiri, passing abruptly from the pine-oak forest of the inner valleys, to the Indo-Malayan rain forest of Assam, though there is no visible barrier. From Jamiri I was able to turn south again and crossing the last range at under 6000 feet we reached the Bhareli river on October 26. We were now almost on the plain. Two days later we crossed the mythical "inner line" into administered territory; and Tezpur was reached at the beginning of November after a journey lasting six months.

The principal geographical results of my journey and the conclusions to be drawn from them may be summarized as follows:

I. Between the Assam Himalaya and the Tsangpo are two lesser ranges of fold mountains, composed mainly of sedimentary rocks. These ranges can be traced from the 92nd to the 94th meridian, east of which they disappear. Both ranges are intermittently elevated above the snow line though the peaks probably nowhere exceed 20,000 feet. The many glaciers have long since disappeared. Takpa Shiri stands on the southernmost range; it is not on the main Himalayan range. The high peaks immediately east of the Trigu Tso observed in 1924 probably stand on the northern range.

II. These fold mountains are composed of slates, phyllites, schists, and limestone, with numerous quartz veins, and are highly contorted. Examples of this contortion are particularly well seen immediately north of the Rip La, north of the Mo La, and in the gorge of the Char chu below Sanga Chöling. On the sierra-like ranges the strata are often vertical and the sharp saw-edged spurs present one precipitous and one sloping face.

III. The Loro chu and the Char chu both flow along cracked anticlines, as is shown by the rocks dipping away from the rivers on both sides. The strike of the rocks is approximately east–west. These valleys are not glaciated, though the short tributary valleys from north and south are glaciated in their upper courses.

IV. North of the Tsangpo, between the same meridians, 91°–94°, is a single range separating the basin of the Tsangpo to the south from those of the Gyamda and Kyi rivers to the north. There are snow peaks and small glaciers on this range also, but it has been much more extensively glaciated in the past. It has little in common with the fold ranges to the south however, for it is composed mainly of igneous, not sedimentary, rocks; towards the summit of the range the rock is sometimes arkose, formed directly from the decomposition of igneous rock. Possibly, as suggested in an earlier paper,[1] it is a continuation of the range north of Gyantse, which may cross the Tsangpo in longitude 92° 30′. The general direction of this range, where it has been observed, is north-east–south-west, that is parallel to the main Himalayan range. East of Tsetang, four passes, the Kumba La, Gechi La, Ashang Kang La, and Sho La, connect the Tsangpo valley with the Gyalam (or China road) between Lhasa and Gyamda. These passes are used by traders between

[1] *Geogr. J.*, February 1926.

Takpo and the north and by pilgrims visiting Tsari. The Ashang Kang La was the only one explored in 1935. I crossed the Kumba La in 1925.

V. Broadly speaking the evidence of former glaciation in Tibet, south of the Salween river, decreases from east to west. There is ample evidence of glaciation on the transverse ranges which cross the plateau north of the Himalaya, at least as far west as the 90th meridian; but none whatever for the glaciation of the plateau itself, though it formerly enjoyed a moister climate.

VI. I was able to extend considerably the known areas of most intense glaciation in south-eastern Tibet, to north, south, and west. Thus the whole of Tsari has been glaciated: the mountains between Tsari and the Tsangpo, the range north of the Tsangpo referred to under IV above, and the upper Po-Yigrong basin. It is hardly an exaggeration to say that during the maximum advance of the ice the whole of south-eastern Tibet between the meridians of 90° and 100°, and the parallels of 28°–32°, was covered by an ice sheet, so large and numerous were the glaciers. This represents an area of about 150,000 square miles, and it was by far the largest (more or less) continuous ice sheet north of the Himalaya.

VII. One inevitable result of the retreat of the glaciers has been a diminution in the volume of the rivers which they feed. This is well seen in the headwaters of rivers like the Subansiri, particularly the Loro chu. The vast accumulation of gravel in the valley below Karta was laid down by a much larger stream than the present one, as the size of the boulders moved also testifies.

VIII. The following five passes south of the Tsangpo were crossed and explored for the first time. Over the southern fold range, the Drichung La and Mo La. Between Sanga Chöling and Tsari, the Rip La. Between Tsari and the Tsangpo, the Bimbi La and Lang La.

IX. Beyond Migyitun and the Tsari river the sacred lake Tsoga, and the snow peaks and glaciers overhanging it, were discovered. These peaks are probably on the main Himalayan range.

X. North of the Tsangpo, from west of the 94th meridian to east of the 95th stretches a great range of snow mountains comparable in height with those at the eastern end of the Assam Himalaya. Its distance from the Tsangpo varies from less than 25 miles in the neighbourhood of the 95th meridian to over 50 miles farther west. This range, in the portion explored between Gyamda and Tongkyuk, trends approximately east–west, and converges on the Assam Himalaya towards Namcha Barwa. There is no record of its having been observed from the north; but in 1924 Lord Cawdor and I obtained an extensive view of it from Tsela Dzong at a distance of about 50 miles. I propose to call it the Po-Yigrong range, since the part explored lies in the Po country.

XI. This range is composed mainly of igneous rocks. There is no evidence however, other than its igneous composition, that it is an eastward extension of the range I crossed between the Gyamda river and the Tsangpo. It seems more likely that its westward extension lies north of Gyamda, where it forms perhaps the northern watershed of the Gyamda river system.

XII. Its glaciers give origin to the following rivers: Yigrong and Tongkyuk rivers entirely; Gyamda river (eastern branch) entirely or mainly; tributaries

of the Gyamda river, *viz*. Drukla chu, Pasum chu, and a few smaller left-bank tributaries.

XIII. The main part of the Po-Yigrong range lies south of the Po-Yigrong, and the highest peaks stand between that river and the Pasum Tso drainage. But the snow peaks north of the Po-Yigrong might also be on the same range, if the range has a double crest line. The Po-Yigrong appears to have cut its valley athwart the range.

XIV. The following passes in order from east to west are on the main range: Sobhe La, Ba La, Lochen La, Tse La, Pasum Kye La. The Sobhe La, Lochen La, and Tse La were crossed for the first time, and the Ba La roughly located. Lord Cawdor and I discovered and crossed the Pasum Kye La in 1924. The Nambu La, crossed in 1924 and again in January 1925, is not in the main range.

XV. The high peaks occur in groups. One group stands opposite and south of Ragoonka; another group which gives origin to a large glacier blocking the Po-Yigrong valley is near Nyotö; a third, at the extreme head of the valley. The height of no peak is known. From the size of the glaciers and the levels to which they descend it is safe to say that the highest peaks exceed 23,000 feet. All the glaciers seen are, and have long been, retreating. Nevertheless they rank with the largest known north of the Tsangpo.

XVI. I followed the gorge of the Po Yigrong westwards for nearly 100 miles, discovered the large villages of Temo Chamna, Tage, Ragoonka, Nyöme, and Nyotö, and found the source of the river in a group of glaciers just south of Atsa. The only *longitudinal* glaciers observed are at the source of the Po-Yigrong. I counted over forty transverse glaciers descending to the Po-Yigrong between the Sobhe La and the Lochen La. In 1925 I suggested that the stream which flows eastward from the Atsa Tso might prove to be the source of the Po-Yigrong. This is now known to be incorrect, though it is quite possible that the Atsa Tso flows into the Po-Yigrong system lower down.

XVII. The gorge of the Po-Yigrong is comparable with that of the Tsangpo itself in depth, though not in length.

XVIII. There is only one route out of the Po-Yigrong gorge northwards, namely that up the Alado [1] chu from Nyo. This route crosses the Alado La, and two other passes and connects with the Gyalam east of Atsa at Alado.

XIX. The east and west continuations of the range are unexplored, but eastwards it certainly extends through Pome. Gyala Peri and Markandro, the latter peak discovered in 1924, appear to be directly connected neither with this range nor with the Assam Himalaya. Gyala Peri is almost due north of Namcha Barwa, at a distance of 16 miles, so that it can hardly stand on the main Himalayan range which is here particularly narrow. There is more evidence to connect these peaks with the "Ladakh" range than with the Himalaya; they may stand on the eastward extension of the range already referred to as separating the Tsangpo from the Gyamda and Kyi rivers, which in turn may continue the "Ladakh" range. Namcha Barwa is 45 miles due north of the Dihang, and 120 miles from the foot of the Himalaya in Assam. As the fold range must have some extension northwards from its

[1] Alando as pronounced to me; I have not altered the present spelling.

crest line, the width of the Himalaya, to include both Namcha Barwa and Gyala Peri, would be about 200 miles. Even where it is broadest, the Himalayan range does not exceed 125 miles from north to south.

XX. The Po-Yigrong range is not, at least in the region explored, the Tsangpo–Salween watershed, which lies farther north. This region appears to be a region of maximum elevation, both for the Assam Himalaya (Namcha Barwa, Sanglung) and for the ranges north of it—the Gyala Peri and Po-Yigrong ranges.

XXI. Crossing the plateau of Tibet are great ranges of mountains separated by wide shallow troughs. In eastern and south-eastern Tibet more ranges emerge than entered it in the west, they are closer together and less parallel than the central Tibetan ranges. It appears that some of the original wide ranges have been split by longitudinal glaciers, and the work of dissection completed by rivers. But some of the eastern Tibetan ranges may originate there. Before the geography of Tibet can be understood the difficult task remains to rebuild the original ranges as they were upraised, combining the parts correctly. The Po-Yigrong range bears much the same relation to the eastern Himalaya that the "Ladakh" range (in long. 76° E.) bears to the western Himalaya.

XXII. The Po-Yigrong range defines the boundary between the forested Po country to the south and the dry grazing plateau country to the north. It fulfils farther east the function of the Assam Himalaya in the west, that of a rain screen.

XXIII. The Gyalam nowhere touches the main course of the Po-Yigrong, but is separated from it by the great snow range which I crossed. In the most recent map of this part of Tibet published by the Survey of India, corrected to 1929 (sheet 82 1/M) two streams are shown between the meridians of 94° and 95°, meeting at Alado; the Sya chu from the east, the Nok chu from the west. These are shown as the sources of the Po-Yigrong. They can be however no more than the sources of a tributary, since the main stream flows from the west, some distance south of Alado. From Nyöme three passes have to be crossed before Alado is reached. This might mean either that the two streams first mentioned do not flow to the Po-Yigrong, or that the Alado chu flows in a deep and narrow gorge, as in fact I saw it doing. The big stream which flows past Pungkar and Drukla Gompa is the one I crossed between the Lochen La and the Tse La; it rises amongst snow peaks round the Pasum Kye La, which separate it from the Atsa Tso. My journey definitely links up these peaks with Namla Karpo, the high peak identified in 1924, and those round the Sobhe La north of Tongkyuk, all of which stand on the one range—the range Cawdor and I saw north of us in 1924. The snow peaks near the Ashang Kang La probably lie on another range.

XXIV. There remains the possibility that the Po-Yigrong range is the eastward extension of the Ninchinthangla range, which Burrard suggests, reasonably, is continued eastwards. But in longitude 93° E. that range is 120 miles north of the Tsangpo whereas the Po-Yigrong range is nowhere more than 50 miles distant. The Littledales crossed the Ninchinthangla range north of Lhasa; but Nain Singh, who traced it for 150 miles, found that it trended north-eastwards, forming the watershed between the Tsangpo and the

Tibet lake-basin. Thus in longitude 94° E. it is a long way north of where I crossed the Po-Yigrong range. The two cannot be identified.

XXV. The botanical results are of exceptional interest and throw considerable light on the origin and distribution of the Tibetan flora. I was able to confirm the separation of the flora into two zones, a "dry" flora and a "wet" or forest flora corresponding to the two main divisions of the country, namely the main plateau and the dissected plateau or river gorge region.[1] The "dry" flora is further divisible into a plateau flora proper (either "cold dry," or "warm dry") and an alpine flora on the transverse ranges; these botanical divisions corresponding with the physical features of the country. The "wet" flora is likewise divisible into forest filling the gorges themselves, and an alpine flora on the enclosing ranges. Finally the unity of the Tibetan flora has been again demonstrated, and its similarity to that of western China and the Himalaya established. The botanical results are however fully dealt with elsewhere.

DISCUSSION

Before the paper the PRESIDENT (Major-General Sir PERCY COX) said: My Lords, Ladies and Gentlemen,—The older I grow the quicker time seems to go. It seems to me only the other day that we welcomed Mr. Kingdon Ward here on his return from his previous journey of 1934, after which he read us a paper entitled "The Himalaya East of the Tsangpo." In thanking him for that paper you joined me in expressing the hope that it would not be long before he set out again. He has now returned after another fine trip, having been away a year during which he has covered a great deal of ground, this time not in the Himalayas but beyond the mountainous country north of the Tsangpo. Those of you who were present at his lecture of November 1934 will recall the beautiful photographs that he showed us, and I am sure are looking forward very keenly to what he is going to present to us this evening.

It is quite superfluous for me to take up time with any introduction of Mr. Kingdon Ward. As you know, he is a Gold Medallist of the Society, and is a familiar figure on our platform. I ask him now to read his paper.

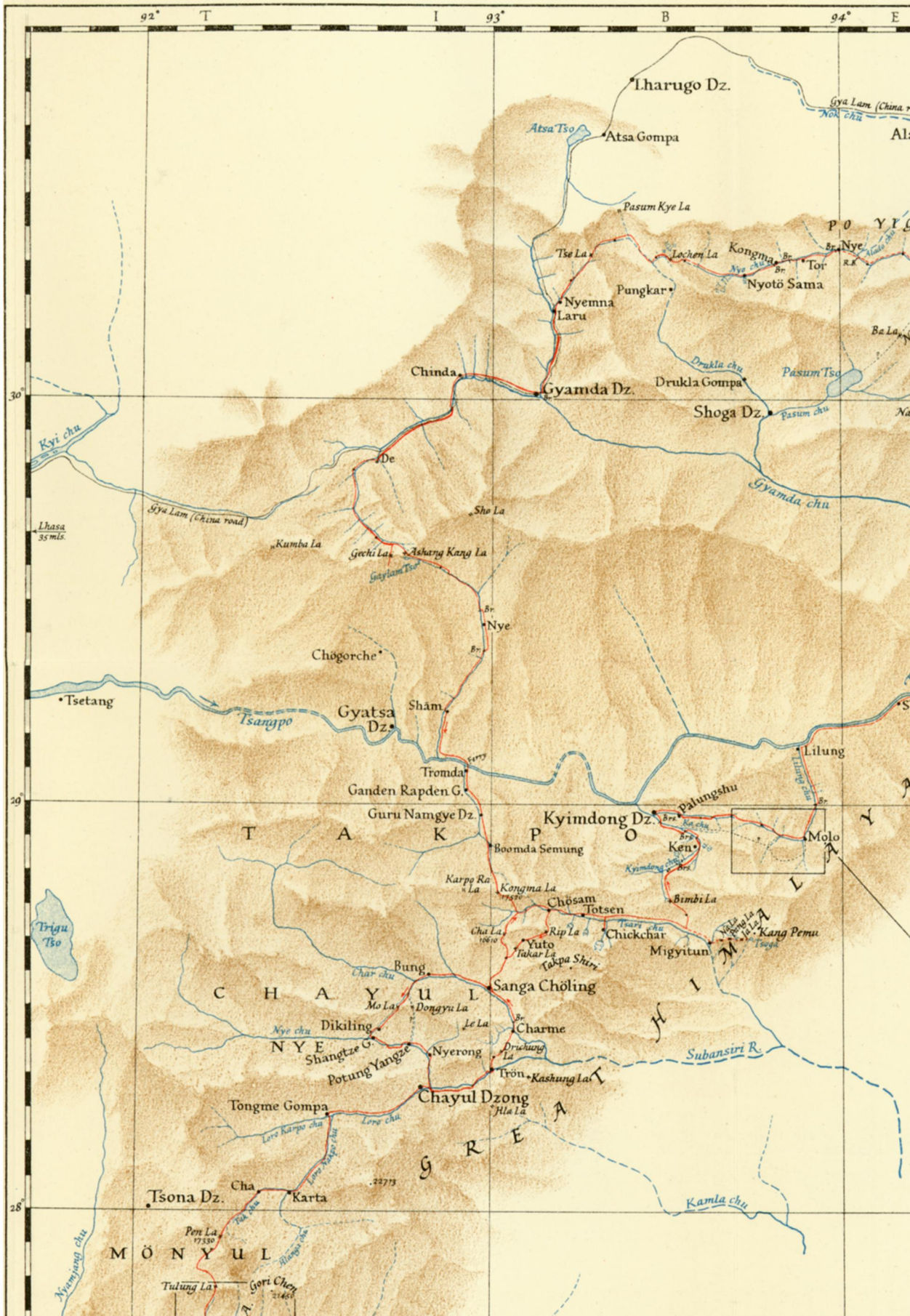
Mr. Kingdon Ward then read the paper printed above, and a discussion followed.

The PRESIDENT: This evening Lord Aberconway has honoured us by his presence. Those who have been reading their newspapers regularly during the past few days will perhaps suppose that he has come to tell us something about the trials of the *Queen Mary*, but it is not in that connection that he is with us. He has come as President of the Royal Horticultural Society, and it is in that capacity that I ask him to come on to the platform and make some observations on the most interesting paper to which we have listened.

Lord ABERCONWAY: Mr. President, Mr. Kingdon Ward, My Lords, Ladies and Gentlemen,—I feel diffident in coming on to this platform, for I have not the honour to be a Fellow of this learned Society, and I am in no way a learned person. My only qualification is that I am a great admirer of Mr. Kingdon Ward and all his works.

I have been privileged to be the recipient of lavish portions of the seeds which he has collected in distant lands; collected not, as he would modestly lead you to believe, by strolling through flowery meads in pleasant weather with the sun shining, but, as I know from him, very often collected under the most horrible conditions, when wet days succeeded wet days, with nothing to live in but a

[1] "A Sketch of the Botany and Geography of Tibet," *Journal of the Linnean Society*, September 1935.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Drukla Gompa
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Nye
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Gyatsa Dz.
Shām
Tromda
Ganden Rapden G.
Guru Namgye Dz.
Kyimdong Dz.
Palungshu
Lilung
Molo
Ken
Boomda Semung
Karpo Ra
Kongma La
Chösam
Totsen
Bimbi La
Chickchar
Migyitun
Kang Pemu
Trigu Tso
Cha La
Rip La
Yuto
Takar La
Takpa Shiri
Bung
Char chu
Sanga Choling
Mo La
Dongyu La
Dikiling
Le La
Charme
Nye chu
Shangtze G.
Nyerong
Driehung La
Potung Yangtze
Trön
Kashung La
Chayul Dzong
Hla La
Tongme Gompa
Lore Karpo chu
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Lore Nagpo chu
Subansiri R.
Cha
Karta
Tsona Dz.
Pen La
Pa chu
Hlago chu
Kamla chu
Nyamjang chu
Tulung La
Gori Chen
MÖNYUL
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GREATER
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Tharugo Dz.
Gya Lam (China road)
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Ragoonka
Shonggyi
Tamchokpa
Boyu
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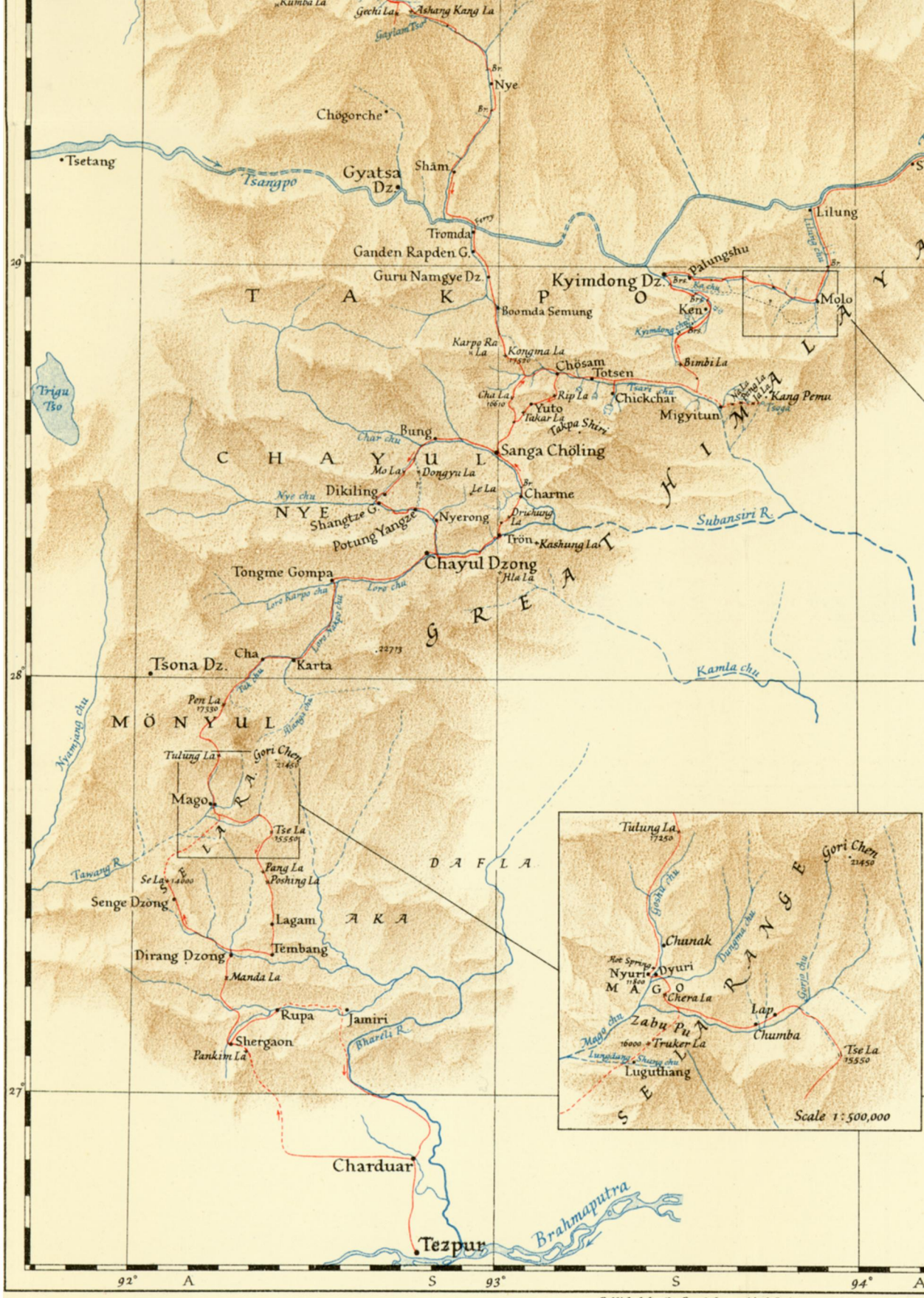
Talu
Tamchokpa
Samling Gompa
Tongbe Dzong
Yigrong Tso
Pungkar
Nyotö Sama
Nyemna
Laru
Temo Chamna
Ba La
Namla Kurpo
PO YIGRONG RA.
Sobhe La
Drukla chu
Drukla Gompa
Pasum Tso
Gyamda Dz.
Shoga Dz.
Pasum chu
Nambu La
Tongkyuk R.
Paka
Tongkyuk Dz
Po Tsangpo
Showa
Markandro
Gyala Peri 23458
Rong chu
Gyamda chu
Lunang
Tumbatse
Temo La
Sangluna 23108
Namcha Barwa 25445
Kyikar
Temo Gompa
Pe
Nye
Tsela Dzong
Tsangpo
Shoka
Lilung
Kyimdong Dz.
Palungshu
Molo
Ken
Boomda Semung
Kongma La
Chösam
Totsen
Bimbi La
Rip La
Chickchar
Yuto
Takar La
Takpa Shiri
Migyitun
Kang Pemu
Sanga Chöling
Charme
Driehung La
Trön
Kashung La
Subansiri R.
Dzong
Hla La
Kamla chu
Lang La
Pa La
Nepar
Barang Shiga
Molo
Ne chu
TSARI
Tsugang
Trashi Gola
SAMA
Trashi La
Lagong
Lagong chu
Scale 1:500,000



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TIBET
Ward

hut whose roof was chiefly holes and where it was impossible to get dry. We who take an interest in plants are most grateful to Mr. Kingdon Ward for all that he has done for us.

I have received the products of many botanical expeditions, but I do not think that any botanical explorer has in one year given us a richer harvest for our gardens than did Mr. Kingdon Ward when he returned from the expedition of 1924, when he first explored the mysteries of the Tsangpo gorge. I believe too that that expedition of his was almost as prolific of new facts for geography as it was prolific of new plants for our gardens. There he found his wonderful *Meconopsis betonicifolia* or "*M. Baileyi*"; there he got countless primulas and countless dwarf rhododendrons. Each year that he goes afield he finds further treasures for our gardens.

There is always one difficulty in connection with plants from Tibet. They, as a rule, like a wet summer and a dry winter. They grow in winter in conditions of frost and snow, where they are frozen, where no rot can attack their roots. The woody plants, the shrubs and rhododendrons, do quite well in our climate if they have a certain amount of water during a very dry summer, because they are not plants that are likely to rot in our mild wet winters. When however you come to the Meconopsis tribe, to the Primula tribe, and the Gentian tribe, you find both that our summer is very dry for them—they suffer unduly even if they are plentifully watered in summer—while our winter is too wet for them and they are apt to rot off at the root.

That lovely yellow primula which Mr. Kingdon Ward showed on the screen but did not name to us, the germs of which I hope are contained in one of his packets of seeds—I regret to see him shake his head, and I fear he left the flower and returned by another route—is the kind of primula which is so lovely on a slide but by the look of it I think, even if he had collected it, would have been difficult to keep in a wet winter. It would have had to live unhappily under a pane of glass, and even then would probably not have survived.

But of all explorers I envy an explorer like Mr. Kingdon Ward, the results of whose explorations we can see every day now in some gardens, and I hope in the future we shall see in even more gardens. We see gardens enriched by the blue of his Meconopsis and gentians, the yellow of his primulas and the scarlet and purple of his rhododendrons, and we shall all be able to enjoy just in one small corner of our gardens one little peep into that glorious country covered with entrancing vegetation of which Mr. Kingdon Ward has given us to-night so excellent an account and representation.

The PRESIDENT: I now ask Mr. Ramsbottom to come on to the platform, if he will be so good. He is Keeper of Botany in the Natural History Museum, South Kensington, and must have interesting comment to make on our lecturer's collections.

Mr. J. RAMSBOTTOM: As you, sir, said, it seems but a very short time since Mr. Kingdon Ward gave his last lecture here. On that occasion I was privileged to say certain things about him, and I am afraid that what I say now may be something on the same lines.

When Kingdon Ward left England last he was rather hoping he would be granted permission to go into Tibet. He went for a short trip to the head-hunting country and then, having a chance to get over into Tibet, he went there. I had a wildly enthusiastic letter from him telling me that he had done it, and you have seen from the wonderful photographs he has shown that he really did do it.

Lord Aberconway has just said what we all know—although not so well as Lord Aberconway does—that horticulture in this country has benefited from the seeds which Mr. Kingdon Ward has brought back from his expeditions.

Now, though fully appreciative of this, it is the other part of Kingdon Ward's story about which I have to speak. When he began his lecture he said he went into Tibet to see what plants were there, how they got there, and how to get them out. There are two ways of getting them out. There is the one in which he sees a plant and goes back and gets the seeds—unless he goes by another route. That is the aspect which appeals to most here and an aspect which you know of.

The other aspect is that on every journey Kingdon Ward has collected plants which he has pressed and which have gone to some of the herbaria in this country. Following his last three or four journeys, the plants he has dried have come to the Department of Botany of the British Museum. Those dried plants are, in their way, just as beautiful as the photographs he has shown. One of the things that always surprises me about Kingdon Ward's travels is the magnificence of his photographs. I cannot think how he can obtain such wonderful photographs under such bad conditions as generally prevail. And moreover it also surprises me that he can bring back from his expeditions such wonderfully preserved plants. Dried plants will rot very quickly if they become damp: they are also very liable to damage by insects. If any here are interested in the collections I shall be very pleased to show them at the Natural History Museum. They are extremely beautiful plants, though of course not so beautiful as the plant you would grow in a garden—even a herbarium botanist is still a botanist and prefers to see a plant growing. Nevertheless if you are interested in dried specimens, Kingdon Ward's plants are exceedingly well preserved, no matter what your criterion is. When you consider his climbing of ladders in precipitous places, treading on snakes, and so on with collections of plants, you will wonder, as I always do, how he manages to bring the collections home.

Then Kingdon Ward said he went because he wanted to know what plants were there. In spite of all that has been said and written on the distribution of British plants we do not yet really know our own British flora completely, much less do we know the flora of places such as Tibet, some parts of which botanists have never trodden. I do not know whether I am right, but I think that Kingdon Ward is the first traveller to have visited certain parts of Tibet.

The question of getting a knowledge of the flora of Tibet is related to the problem of working out the relation of the Tibetan flora across to the Chinese flora and down to the Siamese flora.

Well, when one starts talking of Kingdon Ward one is apt to go on rather longer than one ought, but if I may add something to show the appreciation that botanists as botanists have of the work on geographical botany that Kingdon Ward has accomplished, I should like to say that the Linnean Society of London has appointed Mr. Kingdon Ward to give the Hooker lecture which is delivered every five years. He will give that lecture on April 23.

The PRESIDENT: I regret that, so far as I know, there is no one present who can speak on the geographical aspect and achievement of Mr. Kingdon Ward's journey. You will have noticed, as I did, that he said nothing as to his own arrangements for his daily bread—what he carried, whether he lived as a Tibetan, and, if not, how he lived. Before I sum up I would like him, if he will, to enlighten us a little on that subject.

Mr. F. KINGDON WARD: The essence of travelling rapidly in Asia is undoubtedly to travel light, though I do not profess to compete with Mlle. Maillart and Mr. Peter Fleming, who are able to cross Asia with two men, a boy and a donkey. I was however travelling pretty light.

I had when I left India twenty-four loads, a load being never more than about 50 lb. These included two boxes of stores, a couple of tents, my bedding

and that of two permanent servants with me, and of course a vast quantity of drying paper for plants. After travelling for about a month and having reached a convenient base in Tibet I dumped half my loads, put them in a sort of local cloak room as guarantee that I was returning there, and set out with twelve loads on a journey which I thought would keep me absent for about a month. I was actually absent for ninety days. Of those twelve loads two or three were botanical drying paper; I had also my bedding and that of my servants, tents, and a few cooking pots and stores. For the most part, my servants and I lived on the country. It is always possible to get butter and milk in Tibet, and the older I get the more easy I find it to live on milk. In fact, in my fiftieth year I lived chiefly on milk just as I did in my first year.

We did not get very much meat. At the higher altitudes the people do not keep chickens, and there is no other domestic bird which lays edible eggs. Yak are very common in Tibet especially at high altitudes, but they are too valuable to be killed for food. Occasionally a yak dies, and then meat is available.

On the whole, I think if one is sufficiently interested in one's work one does not bother much about meals. When alone one is apt to put such things into the background and, in any case, to hurry over them. It must be remembered that I had none but local interests. I was completely cut off from news of Europe; I had no letters from my family, and nothing to read except 'The History of Tom Jones' and Shakespeare. One cannot always be reading Shakespeare and I read 'Tom Jones' twice. Meals were not very interesting. I just hurried through them and then settled down to do my botanical work.

When you have no trained collectors with you and are travelling almost continuously it is not possible to train people to collect, so you have to do all your own, of course perpetually changing the drying paper and writing the field notes on specimens. That takes up a great deal of time. What with making arrangements for getting transport, writing up my field notes, collecting and drying specimens, one or two hours for meals and a few hours' sleep, my days and nights were, on the whole, pretty full.

The PRESIDENT: I am sure you all agree that the lecturer's little appendix has been very interesting and enlightening. I remember saying two years ago, when he was last with us, that although he undertook his expeditions primarily for botanical purposes, he had a keen eye for geography and never came back without some useful geographical achievement. As you will have realized, his last expedition was by no means an exception. It is gratifying to know that he has been able to locate and follow along a range which so far as I know, and I think so far as anybody knows, has not been seen previously by any European. We congratulate him heartily on that.

I know nothing of botany, but from other aspects of natural history I do know how trying it is and what intense labour and enthusiasm is needed to keep one up to attending to one's specimens after a long day's march; and not only that, but to the examination of them for days afterwards in order to see that nothing is going wrong. As you heard from Lord Aberconway and Mr. Ramsbottom, Kingdon Ward has excelled himself in that direction on this last expedition, with wonderful success.

I realize from the way in which he has held his audience throughout the evening and delighted them with those nice touches of humour which crop up every now and then, how greatly you have all enjoyed his lecture, and I ask you to thank him enthusiastically. I am sure we have not heard the last of him as an explorer, and we cordially wish him health and all else that is needed to enable him to pursue his most valuable voyages of discovery.