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NO. 1 *JULY* 1934

THE YUSUFZAI STATE OF SWAT

MAJOR W. R. HAY, C.I.E., I.A.

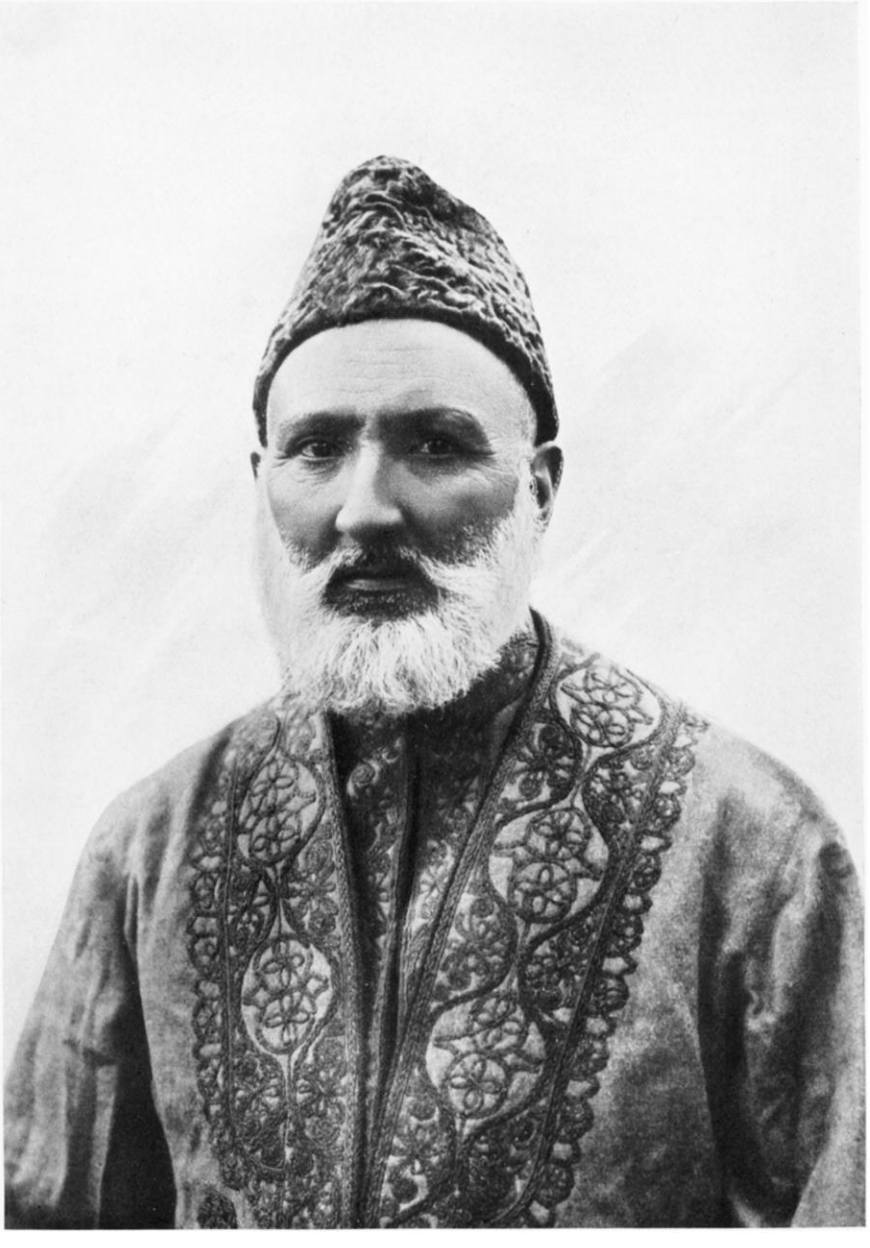
THE object of this paper is to describe the creation and progress of an autocratically ruled State which since 1917 has come into being in the Tribal Territory on the North-West Frontier of British India—the Yusufzai State of Swat, as it is styled by its founder.

The Pathans, who reside in the tribal territory on our border, are essentially a democratic race, and though from time to time a Khan or Mulla has arisen amongst them who has acquired such influence that he has come to be regarded locally more or less as a King, it is doubtful whether an individual has ever before succeeded in establishing over any part of their country such absolute power as that now enjoyed by the present Ruler of Swat, Miangul Gulshahzada Sir Abdul Wadud, K.B.E. Though his State occupies only a very small portion of the world's surface, its creation is such a unique achievement that a brief description of it may not be considered out of place in the Society's *Journal*.

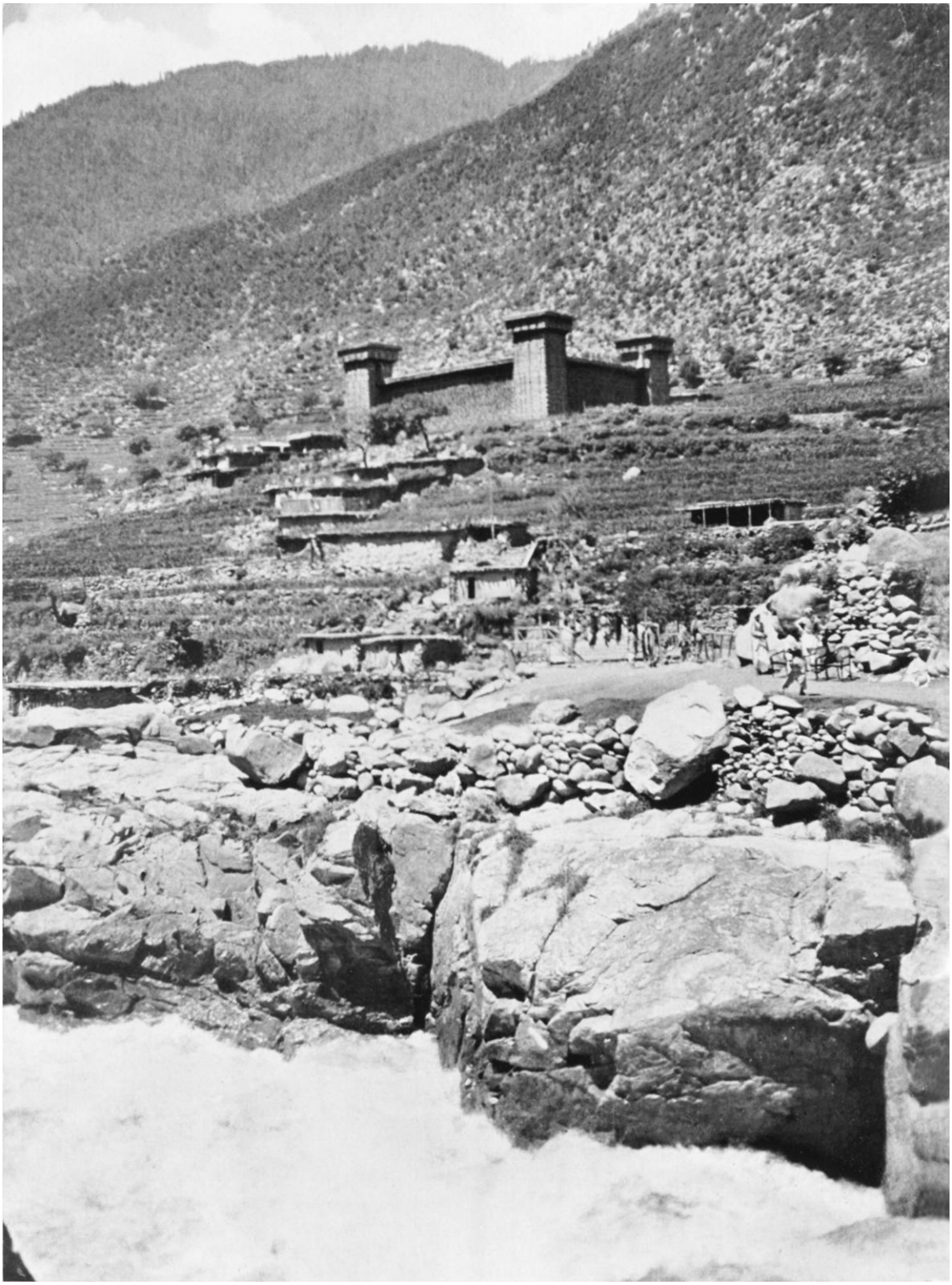
The Swat valley is rich in historical and archaeological associations. It was the scene of one of Alexander the Great's campaigns and the home of an extensive Buddhist civilization. Almost every spur is crowned with the solid remains of ancient dwellings, while here and there in the side-valleys one suddenly encounters the majestic pile of some old *stupa* gradually crumbling away and covered with grass and bushes. This aspect of the country has however been ably and meticulously described by Sir Aurel Stein in his paper which was published in the Society's *Journal* for November and December 1927, and in his book 'On Alexander's Track to the Indus,' and I shall not therefore deal further with it in the present paper.

During the last few years, by the kindness of the Ruler, I have visited many parts of Swat State by car or on foot, while through the courtesy of the Royal Air Force any parts of the State which I have not visited on the ground I have been able to see from the air. I have also had many long talks with the Ruler and those about him and have learnt direct from them all the recent history of the State and the details of its administration.

The Yusufzai are one of the largest of the Pathan tribes on the North-West Frontier of our Indian Empire. They are divided into two main branches, the descendants of Yusuf and the descendants of his nephew Mandanr. The latter are mostly settled in the Mardan Sub-Division of the Peshawar District in British territory, and we shall only be concerned in this paper with a few of them who occupy a fringe of the hilly country on the northern border of the Swabi Tahsil. The descendants of Yusuf are divided into four branches: the Akozai, who occupy the Panjkora and Swat valleys and some very mountainous country between the Swat valley and the Indus; the Malizai and Iliaszai, who live in Buner and some adjacent country towards the Indus; and the Isazai, who are mostly found on the left bank of the Indus but possess a small slice of country on the right bank of that river. All these sections are divided into numerous sub-sections of which I need only mention the powerful Malizai, a sub-section of the Akozai, who occupy practically the whole of the main Panjkora valley and must not be confused with the Malizai of Buner.



Miangul Gulshahzada Sir Abdul Wadud, K.B.E., *Ruler of Swat*



Fort at Baranial

The Yusufzai organization—like that of most other Pathan tribes—is based on the theory that all members of the tribe have equal rights while those who are not members have none. Generally speaking, only a member of the tribe can own land, and any person who ceases to own land loses his tribal rights. Further, in the case of the Yusufzai, most, if not all, of the cultivable land belonging to the tribe was originally liable to redistribution *per capita* at fixed periods of years. This practice has mostly fallen into desuetude but is still in force in some parts across the border. The Yusufzai however differ from most other Pathan tribes on the border in the special position held by their Khans. These are presumably descendants of the men who led the tribe when it first conquered its present territory and received special recognition in consequence. They hold a special allotment of land over and above their ordinary tribal share; it is not liable to periodical redistribution, and on the death of a Khan is normally not split up amongst his heirs but passes undivided to his successor as Khan. The most important of these Khans for several generations has been that of Dir.

Possessing a large individual estate and exercising a certain amount of control over the whole of the Malizai in the Panjkora valley, the Khan of Dir has often extended his authority over neighbouring tracts and in particular over the country occupied by other Akozai sections on the right bank of the Swat river. Since the British Government entered into an agreement with the ruling Khan, Muhammad Sharif Khan, in 1895, in connection with the operations which were undertaken for the relief of Chitral, the position of the Khan of Dir has been greatly strengthened and he is now recognized as a hereditary Nawab and the head of a State much of which he rules with more or less autocratic powers. I am not dealing with Dir State in this paper, but it is necessary to refer to it briefly, because it was the effort of the right-bank Swat tribes to throw off the yoke of the Nawab of Dir which gave to Miangul Gulshahzada the opportunity of establishing his own position and founding a State more extensive and far more absolute than that of Dir.

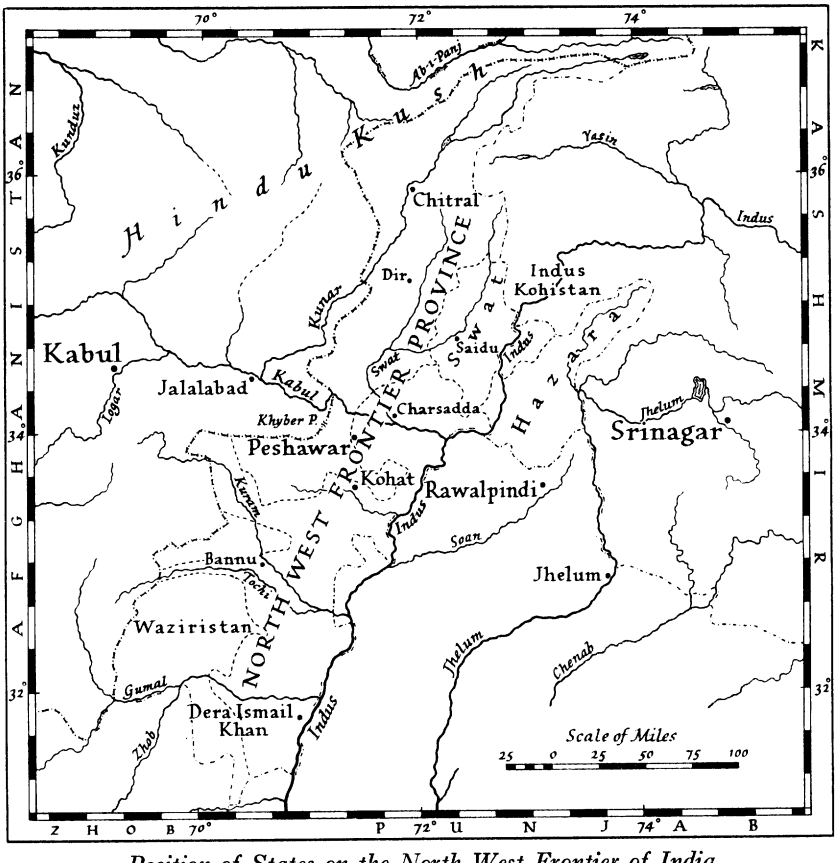
Before proceeding further I will explain the origins of this remarkable man. Some time towards the end of the eighteenth century an ordinary Safi tribesman left his own country on the farther side of Bajaur and settled at a hamlet called Jabrai in Upper Swat. About 1794 a son was born to him called Abdul Ghafur, who as a boy tended flocks and cattle, and when he began to grow up migrated, as many of the Swatis[1] do, to the Peshawar District as a *talib-ul-ilm*, or seeker after religious knowledge. He studied at the feet of various Mullas and eventually settled down as a hermit in a small village near the Indus, where he stayed for twelve years and acquired a great reputation for sanctity.

Local politics at length forced him to migrate, and he wandered about for many years from place to place, until about 1845, when he returned to Swat and settled down at the village of Saidu. Here he remained till his death in 1877. His reputation as a saint rapidly increased and he soon became the leading figure in the valley, being famous all along the frontier as the Akhund

[1] Where I use the word "Swati" I mean an inhabitant of the Swat valley. The name is also applied to a tribe which once had its home in Swat, but now lives on the left bank of the Indus.

of Swat. It was under his lead that the tribes took the field against us during the Ambela campaign of 1863, but apart from this his attitude to the British Government was not generally one of hostility, and his chief anxiety appears to have been to maintain the independence of his beloved Swat. He never aspired to temporal power, but led a simple religious life at his mosque in Saidu, where he was visited by countless pilgrims.

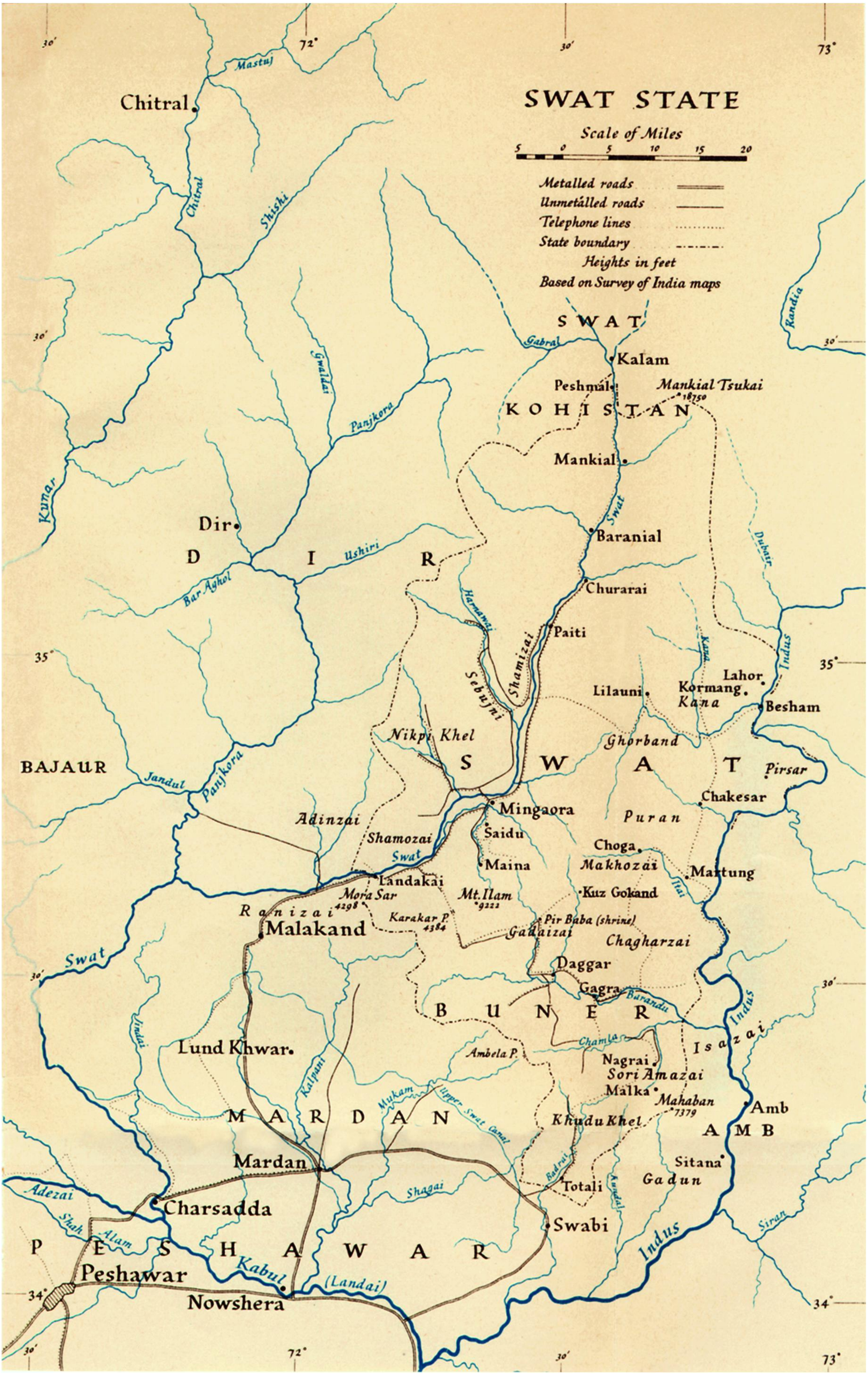
At this time and until the recent rise to power of Miangul Gulshahzada, there was no leading hereditary Khan or Chief in Swat or Buner or any of the



Position of States on the North-West Frontier of India

adjacent Yusufzai territory to the east. There were numerous petty Khans who were always fighting each other and a ruinous sort of party system prevailed. Sometimes one party would be in power and sometimes the other, and the party out of power usually had to abandon its villages and seek refuge elsewhere until it had gained sufficient strength to oust its rivals. These parties were guided by no political principle but purely by self-interest or ancient hereditary attachments. The result of this system was that the whole country was normally in a state of anarchy and chaos.

The Akhund on his death left two sons, Abdul Hanan and Abdul Khaliq,


SWAT STATE
Scale of Miles
5 0 5 10 15 20
Metalled roads
Unmetalled roads
Telephone lines
State boundary
Heights in feet
Based on Survey of India maps
Chitral
Mastuj
Chitral
Shishi
Gwaldai
Panjkora
Kumar
Dir
D I R
Ushiri
Bar Aghol
BAJAUR
Jandul
Panjkora
SWAT
Gabral
Kalam
Peshmal
Mankial Tsukai
18750
KOHISTAN
Mankial
Swat
Baranial
Churarai
Harnawai
Shamizai
Paiti
Sebujni
Lilauni
Kana
Lahor
Kormang
Kana
Besham
Indus
Randia
Duber
Nikpi Khel
Ghorband
S W A T
Pirsar
Chakesar
Mingaora
Puran
Saidu
Adinzai
Shamozai
Swat
Landakai
Maina
Choga
Makhozai
Martung
Kuz Gokand
Mora Sar
4298
Mt. Ilam
9221
Ranizai
Malakand
Karakar P.
4384
Pir Baba (shrine)
Gadaizai
Chagharzai
Swat
Daggar
Gagra
Barandu
B U N E R
Indus
Isazai
Jindai
Lund Khwar
Ambela P.
Chamla
Nagrai
Sori Amazai
Malka
Mahaban
7379
Kalpani
Mukam
Upper Swat Canal
M A R D A N
Khudu Khel
Amb
A M B
Mardan
Sitana
Badrai
Gadun
Totali
Adezai
Shagai
Charsadda
Swabi
Siran
Shah Alam
P E S H A W A R
Kabul
Indus
Peshawar
(Landai)
Nowshera
72°
73°
30′
35°
34°

who with their descendants received the appellation of Miangul. Abdul Hanan was ambitious of temporal power and played a prominent part in local party politics, but without achieving his object. Abdul Khaliq led the life of a religious recluse. Abdul Hanan died about 1887 and Abdul Khaliq in 1892. Abdul Hanan left two sons, Said Badshah and Mir Badshah, and Abdul Khaliq two sons, Gulshahzada and Shirin. All were still minors when Abdul Khaliq died in 1892. They soon began intriguing against each other, and the parties in Swat ranged themselves behind rival Mianguls. Said Badshah was murdered by his brother and cousins in 1903 and Mir Badshah was shot dead by Gulshahzada in 1907. The elder branch of the family thus became extinct, but the two brothers Gulshahzada and Shirin continued to intrigue against each other till 1915, when the appearance of a rival in the field forced them to unite.

At this time the Swat tribes were engaged in one of their periodical attempts to free the right bank of their valley from the yoke of the Nawab of Dir, and in order to bring about the union necessary to achieve this object, they determined to take unto themselves a king. Once in the time of the Akhund, when they feared a British invasion, they had a king for a few years, and it was his grandson they now called in, Abdul Jabar Shah, a Saiyid from Sitana in Amb territory on the right bank of the Indus. The Mianguls at once began to work against him, and allied themselves with the Nawab of Dir; they were however defeated and for a time turned out of Saidu. They were soon back again, and it was not long before the Swatis grew tired of Abdul Jabar Shah, who had not proved successful as a leader in the field and being an Ahmadi had come to be regarded as a heretic by the Sunni inhabitants of the valley. In September 1917 they quietly escorted him out of their country and invited the Mianguls to take his place as joint rulers. The Mianguls readily accepted the offer and were not slow in consolidating their position and taking the field against the Nawab of Dir. It was perhaps providential for the future peace of the valley that the younger Miangul, Shirin, was killed in a fight with the Nawab's forces in 1918, and that Gulshahzada was left in sole and undisputed authority.

The Nawab of Dir continued his efforts to reconquer his revolted provinces on the right bank of the Swat river, but in August 1919 he suffered a crushing defeat in the Harnawai valley, as a result of which Gulshahzada was able to eradicate the last remnants of his authority over the right-bank Swat tribes and even to occupy Adinzai, which had long been regarded as an integral part of Dir State, and through which a section of the Chitral road runs. Fighting continued in Adinzai till 1922, when Government was forced to intervene and the Nawab of Dir and Gulshahzada were induced to sign an agreement whereby Adinzai was handed back to the Nawab, and each ruler undertook to refrain from interference in the other's territory. A limit was thus set to the expansion of the new State towards the west. North of the Swat river it marched with Dir State, the boundary from north to south being the main Swat–Panjkora watershed as far as Adinzai, and then a subsidiary watershed running down to the Swat river between Adinzai and Shamozai; while south of the Swat river the Landakai and Mora ridges separated it from Ranizai, a tract which was taken under the protection of the British Government when the Malakand was occupied in 1895. Adinzai, Shamozai, and Ranizai are names which denote

originally certain sub-sections of the Akozai tribe, but are also applied geographically, as is often the case, to the tracts allotted to the same sub-sections in the original distribution of Yusufzai land.

During his struggles with the Nawab of Dir, Gulshahzada had frequently to face the opposition of recalcitrant Khans in the Swat valley itself, but by 1922 he had completely established his authority over all the Swat Pathan tribesmen. At the northern end of the valley however is a large block of extremely mountainous country occupied by non-Pathan races who are loosely known as Kohistanis. These are probably the descendants of the people who were forced northwards into the mountains when the Yusufzai occupied the lower valleys. They boast an Arab origin but speak a variety of "Dardic" languages. The majority in the Swat valley employ a dialect which is known as Torwali, but the inhabitants of one side-valley use Khilliwal, the language of the Indus Kohistan, while there is at least one village in the extreme north of the main valley which speaks Khowar, the language of Chitral. The Swat Kohistanis had helped some of the Khans of the lower part of the valley in their efforts to curb the Miangul's increasing power. The Miangul therefore, as soon as he was free from anxiety on the Dir side, at once turned his attention to them. Although they are a wild and independent people they possess no cohesion, and he had little difficulty in occupying the whole of their country as far north as Peshmal. Above this at the extreme northern end of the valley is a tract containing valuable forests which is usually referred to as Kalam, though properly speaking this is only the name of a single village. His Highness the Mehtar of Chitral had long laid claim to this tract, and when the Miangul showed signs of occupying it His Highness first sent a peaceful mission to Saidu and then began to mobilize his forces. Government was again forced to intervene, and the Miangul agreed not to interfere in Kalam provided the Mehtar of Chitral and Nawab of Dir similarly refrained from interference. Kalam has thus been left as a sort of no-man's-land in a maze of snow-capped peaks between the three States.

Having dealt with the west and the north the Miangul now turned his attention to the south. Across the mountains which bound the Swat valley in this direction lies Buner, a wide open tract of country drained by the Barandu river. At this time Buner was more or less controlled by a party of Khans with their headquarters at Daggar. As elsewhere in Yusufzai country there were two factions, and sometimes one set of Khans was in power and sometimes another. Early in 1922, while he was still fighting with the Nawab of Dir in Adinzai, the Miangul had been seriously threatened by a tribal force from Buner under the ex-King of Swat, Abdul Jabar Shah. In April 1923 therefore he dispatched his Wazir with a large force and occupied the whole of Buner and the Chamla valley beyond it without a single shot being fired. The method pursued by the Miangul when he had made up his mind to occupy new territory was to make friends with one of the local factions. He would then enter the country in support of that faction, and having half the country already on his side, his forces were usually sufficient completely to overcome the opposite faction. In this case however the Miangul was not left in undisputed possession of his newly acquired territory. The Nawab of Amb, a small State on the Indus, was determined to curb the Miangul's

rapidly growing power and sent a force into Chamla. Some quite severe fighting ensued, but one night the Nawab of Amb's forces suddenly melted away without having suffered any serious reverse. The next year the Miangul advanced still farther and occupied the tracts known as Khudu Khel and Sori Amazai, and began to interfere in Gadun country. Meanwhile the Nawab of Amb had asked Government to intervene, and as it was considered undesirable that fighting should continue between the two rulers, a neutral zone was fixed which included Gadun and Isazai country, and they were both forbidden to interfere in it. By the conquest of Buner, Chamla, and Khudu Khel the Miangul had extended his dominions on the south right up to the border of British administered territory, while to the south-east his further advance was prevented by the neutral zone described above.

North of the eastern portion of Buner and east of the Swat valley lies a stretch of extremely mountainous country intersected by deep ravines running down to the Indus. Most of this is occupied by Akozai tribes who have their headquarters on the left bank of the Swat river. With the occupation of Buner a small portion of this country, called Makhozai, also passed under the Wali's rule and he constructed a fort at a place called Choga. Here he was almost immediately attacked by the tribesmen of the adjoining tracts. He proceeded to beat off the attack, and before the end of the year had occupied the whole of the country down to the Indus, which he was forbidden by Government to cross.

There was now only one direction in which further advance was possible—the north-east, where lies the wild and little-known Indus Kohistan. Here again assistance afforded to rebel Khans gave the Miangul an excuse for action. In 1925 he occupied the Kormang valley, and in 1926 he advanced farther and established posts at Lahor and Besham. In doing this however he encountered unexpectedly heavy opposition and many casualties were sustained. In the winter of 1926–27 the Kohistanis made vigorous efforts to expel his forces from Lahor; they were repulsed after heavy fighting, but no attempt has since been made to penetrate farther into the Indus Kohistan. Beyond Lahor is a great tract of extremely mountainous country comprising the Dubair Seo and Kandia valleys and containing rich forests. It is believed that no European has ever visited it. The inhabitants live in village communities, acknowledge no ruler, and are said to devote most of their time to their local feuds. They speak a tongue which is known as Khilliwal.

In May 1926 Government formally recognized Miangul Gulshahzada as Wali or Ruler of Swat, while he in turn undertook to respect the various boundaries prescribed for his State. In 1933 his eldest son Jahanzeb was similarly acknowledged as his Wali-i-Ahad or Heir Apparent.

I will now endeavour to give a brief geographical description of the new State, and will then say something about the Wali's system of administration and the great progress which the country has made under his beneficent rule.

The boundaries of the State have already been described. In shape it is roughly a rectangle with the Khudu Khel country as an excrescence at the south-eastern corner. Its length from north to south measures about 80 miles, and its width from west to east about 60 miles. Its population is estimated

at about 300,000, and, except in the Kohistani country in the extreme north, consists of Yusufzai Pathans with a large admixture of Saiyids, Mians, and various menial classes, together with a few Hindus.

For purposes of administration the State is divided into four provinces: (1) Swat proper; (2) Buner; (3) the Mandanr country consisting of Chamla, Sori Amazai, and Khudu Khel; (4) the country lying between the eastern watershed of the Swat river and the Indus. Though these divisions are partly racial in character they form a satisfactory basis for the geographical description of the country.

The Swat valley is one of the beauty spots of northern India, rivalling even Kashmir. Fed from numerous sources amongst the snows of the Kohistan the Swat river cleaves its way through forest-clad slopes down to Paiti, where the valley begins to broaden out until it attains a width in places of 3 or 4 miles. The river also grows wider and splits here and there into numerous channels enclosing fertile islands. It is difficult to say whether the valley is more beautiful in the early autumn when the full river winds its way through vivid rice-fields and the hill-slopes are green after the summer rains, or at the beginning of spring, when the more slender stream laces the valley with the deepest blue, and the young wheat and barley crops are full of pink-and-white tulips and blue lilies, and the mustard-fields light up the skirt of the hills with a blaze of yellow, while every turn presents a new vista of snow-clad peaks.

The side valleys too are full of charm. Those on the left bank are mostly short and steep with brooks that hurtle down through a tangle of scrub, past narrow terraced fields and occasional clumps of lofty chinars, while those on the right bank are larger and more open. Two of the latter call for special mention. The first of these is the Harnawai valley, which is upwards of 20 miles long and is the home of two important sections, the Shamizai and Sebujni. It is usually referred to by the inhabitants of the main valley as Bar (Upper) Swat. The Harnawai stream has its sources in mountains 13,000 feet high and supplies sufficient water for extensive cultivation. The second valley, which is known as Nikpi Khel from the section which inhabits it, is an open expanse of undulating country drained by several converging watercourses. Cultivation is largely dependent upon rain, and the people in consequence are not so prone to malaria and are of better physique than the rest of the inhabitants of the Swat valley.

In the Kohistan I have only been on the ground as far as Baranial, but in May 1933 I was privileged to fly over the top of the highest peak, Mankial Tsukai, which is 18,750 feet. The Wali was a passenger in the same flight. The whole country is a maze of peaks and ridges intersected by deep forest-clad valleys.

There are no large towns in Swat. The biggest centre of population is Mingaora, where there is a bazaar which has recently been widened and rebuilt by the Wali. The capital of the State is 2 miles away at Saidu, where the Wali resides and where the tomb of the famous Akhund is situated. A few miles above Saidu, in a little valley running down from Mount Ilam, lies Maina, which the Wali has made his summer residence. The only local industry is the weaving of blankets and the country is almost entirely dependent on agriculture except in the Kohistan, where the forests are an important source

of income. No mineral wealth has been discovered. The average annual rainfall in the lower part of the valley is probably between 20 and 30 inches, about half of which falls between December and May and the rest during the monsoon from July to September. There is practically no monsoon rainfall in the Kohistan, but the abundant snow which falls in the winter feeds the Swat river during the summer months. Wheat is the principal spring crop of the valley, while rice and maize are grown during the hot weather. There is sufficient grazing on the hills for considerable flocks and herds, and *ghee* or clarified butter of very good quality is produced, while wool and hides are also exported.

All the lower hills within easy reach of the river have long been denuded of trees, and even in the Kohistan the more accessible forests have been ruined within the past few generations by indiscriminate felling. With the Wali's consent the surviving forests are now controlled by the Forest Department of the North-West Frontier Province, and it is hoped that it will eventually be possible to reafforest some of the denuded areas.

The Swat valley where it forms part of the State is shut in both on the north and south by high mountain ranges, and is only easily accessible from the Malakand Agency lower down in the same valley. To the north the range that forms the boundary with Dir State nowhere drops below about 8000 feet, while the Karakar Pass, the lowest point in the southern range which separates Swat from Buner, is 4384 feet. The latter range contains the peak of Ilam (9222 feet), a well-wooded cone which forms a very conspicuous feature of the landscape as viewed from the plains of the Peshawar District. On its summit is a Hindu shrine which is visited by numerous pilgrims of that faith at certain seasons of the year, and, as Sir Aurel Stein has shown, the mountain was famous as a sacred site in ancient Buddhist times.

Buner I have viewed from the air and from the tops of the mountains that enclose it on the north and south. It is a wide open plain lying between the range of hills which borders the Peshawar plain on the north and the range which has just been described. Its average elevation is about 2500 feet, and it is studded with sudden peaks and ridges. It has an arid aspect and most of the cultivated land is unirrigated, the chief crop being barley. It slopes towards the east and is drained by the Barandu river direct into the Indus. Three considerable valleys debouch into the plain from the north—Gadaizai, Gokand, and Chagharzai, the first and last of these names being tribal and the second topographical. In Gadaizai is the shrine of Pir Baba, the most famous and frequented place of pilgrimage on the North-West Frontier. As is the case throughout the rest of the State the tribesmen live in village communities, and there are no large centres of population.

I traversed most of the Mandanr country in 1929 when I climbed Mahaban (7379 feet) from Gadun country and descended by the Nagrai valley (Sori Amazai) on the farther side to Chamla, returning to British territory by the Ambela Pass at the head of the Chamla valley. Chamla consists of one long valley averaging a mile or two in width and drained by the Chamla stream which flows into the Barandu a few miles above the latter stream's junction with the Indus. It is more fertile than Buner, and derives its name from the fact that after its acquisition by the Mandanr tribe it was divided up into

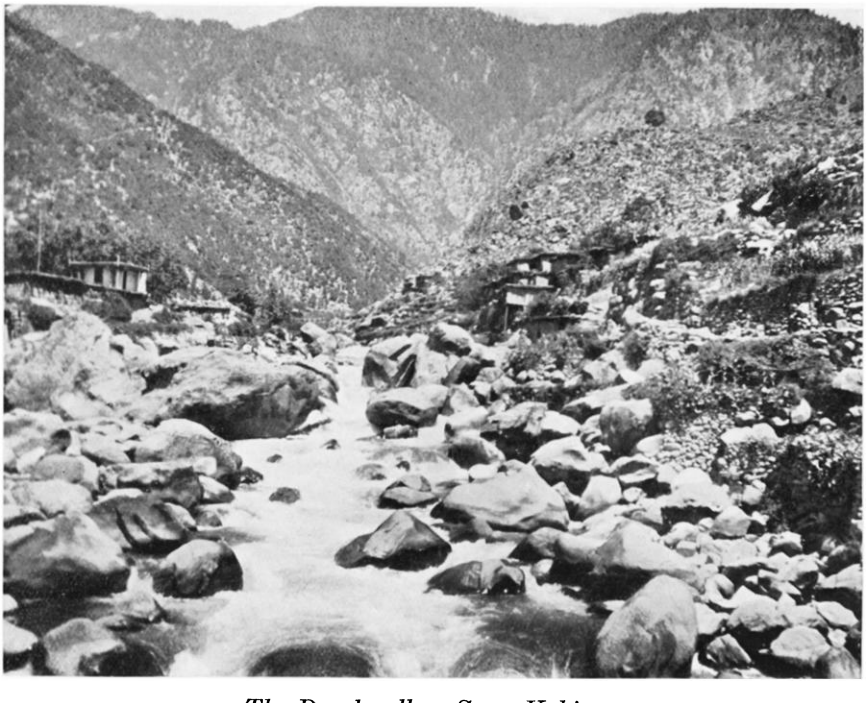
chams or plots, one of which was allotted to each Mandanr sub-section except the Amazai, who were separately provided for in Sori and Pitao Amazai. Sori Amazai, meaning Amazai of the Shade, is a narrow well-watered valley running down from the northern slopes of Mahaban and forms part of the Wali's dominions. The best-known place in it is Malka, which was once the stronghold of the Hindustani Fanatics and was destroyed by the tribesmen in the presence of British officers after the Ambela Campaign of 1863. Pitao Amazai, or Amazai of the Sunshine, lies east of Mahaban and is independent, being part of the neutral zone interposed between the Wali and the Nawab of Amb. Mahaban, which means Great Forest, is a well-wooded ridge and is the highest point of the range which skirts the northern edge of the Peshawar plain. Until Sir Aurel Stein visited it in 1904 it was often erroneously identified with Arrian's Aornos. In the foothill country running up to Mahaban from the south-west lies Khudu Khel. This tract extends right down into the plain nearly as far as Swabi itself, and geographically forms part of the Swabi Tahsil. The Sikhs however never succeeded in subduing the Khudu Khel and their country was therefore not included in the Peshawar District when the British took over from the Sikhs. It remained independent until absorbed by the Wali in 1923, and now forms a sort of excrescence to his State, being the only part of it which lies south of the divide between the Peshawar plain and the Barandu drainage area. The country consists of narrow cultivable valleys among the barren foothills and a strip of plain which is irrigated from the Upper Swat Canal.

I have only seen the country lying east of the Swat–Indus divide from the air. It consists of a tangled mass of mountains intersected by three deep and narrow valleys. The mountains rise to heights of 8000 or 9000 feet and fall away in great sweeps and precipices to tortuous ravines, down which silver streams wind their way towards the Indus. This river has here forged a broad course through successive mountain ranges and flows with a strong but not tumultuous stream at an altitude of less than 2000 feet. The slopes of the hills wherever they are not too steep or rocky are terraced for cultivation up to high altitudes, and there is not much forest. There are only a few large villages and most of the population live in scattered dwellings up and down the mountain slopes. The most southerly of the three valleys in this area is drained by a stream which is called on the map the Itai river, though I have never heard this name actually used. This stream has two forks forming two separate tracts called Makhozai and Puran, which have been made by the Wali into one Tahsil, though they are tribally distinct. The lower part of the valley forms a separate Tahsil with its headquarters at Martung. The central valley is called Chakesar and forms one Tahsil. The northern valley has two forks at its western end—Ghorband and Lilauni—and a large tributary farther down on its left bank called Kana. These form three separate Tahsils. The main stream that drains the valley is known as the Sain Khwar. There is one other Tahsil with its headquarters at Besham on the Indus; this consists of the corner of the Indus Kohistan which forms part of the Wali's dominions.

As far as I know, only one European has visited any part of this country on the ground, and that is Sir Aurel Stein, who identified the height of Pirsar

Bridge over the Swat river at Paiti

The Swat valley at Baranial; Mankial Tsukai in the extreme distance



The Darel valley, Swat Kohistan

lying just north of Chakesar with the famous stronghold of Aornos, the capture of which by Alexander the Great is described in so much detail by Arrian. Sir Aurel Stein has given a description of this expedition in the paper to which I have already referred.

Swat proper is controlled directly by the central authorities who reside at the State's capital Saidu. It is divided up into eleven Tahsils, nine of which bear the names of various Akozai sub-sections and coincide with their tribal holdings in the valley. Of the other two Churarai comprises a few villages occupied by Saiyids and a portion of the Kohistan, while the administrative headquarters of the rest of the Kohistan is at Baranial. Buner consists of five Tahsils based on tribal sub-divisions and is administered by a Hakim or Governor residing at Gagra. In Mandanr the three tracts I have described—Chamla, Sori Amazai, and Khudu Khel—each forms a separate Tahsil, and the Governor resides at Totali in the last-named tract. In the country between the Swat valley and the Indus there are, as already noted, seven Tahsils formed on geographical rather than tribal lines. Six of these are under a Governor who resides at Chakesar, while the seventh, Kana, is for special reasons controlled directly by the central authorities at Saidu. Governors of districts administer the Tahsils in which they reside. Other Tahsils are under Tahsildars responsible either to the Governor or directly to the central State authorities, as the case may be.

The whole State is ruled autocratically by the Wali, who is assisted by his eldest son, the Wali-i-Ahad, his Wazir, and his Sipah Salar or Commander-in-Chief. The Wali-i-Ahad is chiefly responsible for financial matters, the Wazir for the political and judicial administration, and the Sipah Salar for the military organization. The Wali is illiterate but decides every matter of importance himself verbally over the telephone. The revenue of the State is derived chiefly from *ushar*, or the tax on grain and other products, and from tolls on imports and exports. The *ushar* is mostly recovered in kind, and State employees are mostly paid in kind. The average annual revenue works out in cash at about twelve lakhs of rupees, say £90,000, a year. The State finances are carefully handled and the expenditure is not allowed to exceed the income. Justice is administered on the lines of tribal custom. Whenever the Wali occupied a new tract he called upon the local elders to put on record their *riwaj* or tribal custom, and this custom is normally followed in all cases of purely local importance. Offences against the State or crimes affecting the public welfare, such as highway robbery, are generally settled by the Wali himself on their merits.

Before the Wali had consolidated his position every tribesman was armed and was under an obligation to turn out for his ruler or tribe in a time of emergency. As soon as he felt himself strong enough the Wali disarmed all his subjects except at one or two points in his State where there is a danger of attack from outside. The more serviceable of the arms he immediately reissued to selected men in each village as State property, thus creating an army of his own to take the place of the old tribal *lashkar*, which lacked all organization and was liable to be fickle in its allegiance. The army is paid in kind and is divided into two separate forces. One mans the numerous forts, with which the countryside is studded, and may be regarded as a sort of

constabulary, while the members of the other live in their villages ready to take the field when necessity arises.

The progress made by the country under the Wali's strong but beneficent rule is marvellous. Peace and order reign even in the most remote and mountainous regions and trade flourishes. At Saidu there is a large school with about five hundred boys, a well-attended hospital, and a veterinary dispensary. There are also schools in many of the outlying districts. Fine residences have been erected at Saidu for the Wali and his eldest son, and several of the leading Khans and Maliks in the villages have built for themselves large tin-roofed bungalows on more or less modern lines.

Amongst other reforms the Wali has abolished the *wesh* or periodical redistribution of land except in the case of the rice-lands in the Swat valley, where constant changes in the stream afford some justification for the system. Formerly in the case of one at least of the Swat tribes whole villages used to change hands every few years.

Perhaps the most notable development is in the matter of roads and telephones. The Wali has fully realized the importance of both of these for tribal control. In Swat there are now about 150 miles of motorable roads. These run along both banks of the main river as far north as Churarai, and up several of the side valleys. In Buner and Chamla too excellent roads have been constructed between the Tahsil headquarters, but these districts will not be accessible by car until the road over the Karakar Pass has been completed. Much money has already been expended on this road, but in the present financial stringency the Wali cannot find sufficient funds to complete it. In the Indus tracts the country is so mountainous that the expense of making motorable roads would be prohibitive; the Tahsil headquarters however have all been connected by good riding paths. In addition to this the whole of the State is covered by an elaborate telephone system, so that the Wali can at any moment ring up his officials in the remotest parts of his dominions.

How great is the achievement of one man in thus carving out for himself a State amongst the wild frontier hills only those who know the nature of the tribes and the character of their country will be able to appreciate. Miangul Gulshahzada Sir Abdul Wadud, K.B.E., Ruler of Swat, is now in his fifty-first year and is still as strong in body as he is in will. He starts his day at dawn with a constitutional, usually a 1000-foot climb, and is extremely frugal in his habits. He is a first-class shot and spends most of his spare time on *shikar*. He is the most genial of hosts and unsparing in his hospitality, and loves nothing better than sharing his sport with his friends. The Wali-i-Ahad is polished and capable and should in due course prove a worthy successor to his father. Let us hope that the State which Miangul Gulshahzada has founded will continue to prosper and remain for very many years to come a haven of peace on our troubled border.

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THE KARAKORAM AND TURKISTAN EXPEDITION OF 1929-1930: *A paper read at the Evening Meeting of the Society on 23 February 1931, by*

DR. PH. C. VISSER

DIFFICULT though it may be to give in a limited space an account of an expedition which took more than one and a half years and which not only had a geographical aim, but at the same time had in view the investigation of geological, glaciological, zoological, botanical, and meteorological problems, I will nevertheless try to give in a narrow compass a synopsis of our third expedition to the mountains of Central Asia.

This time our object was first of all to explore the as yet unknown regions of the Karakoram and Saltoro-Karakoram (formerly known as Kailas-Karakoram[1]) lying in the upper course of the Shyok and Nubra rivers. In this part of the Karakoram, which differs entirely from that which we visited in 1925 in Hunza, it looks as if Nature had tried not to compress the greatest possible number of mountain ranges into the smallest possible space, as is the case in Hunza, but just to model them on a wider base, thereby leaving space between the mountains and ranges, as if to show them better. Whoever has admired a Jungfrau or Bernina, a Mont Blanc or Breithorn, will be able to understand that Matterhorns are not always required to make a landscape charming and impressive. In the Saltoro-Karakoram we found however almost perpendicular granite walls among the highest in the world, and we found mountains which need yield to none as regards beauty and majesty.

Our programme further included the exploration of the tableland, at that time still unmapped, which is situated to the east of the Karakoram Pass and the regions of the Kunlun, which confine it on the north; also observations on the borderlands of the Taklamakan desert. Not only did we intend to map out as carefully as possible the mountains which we had chosen for exploration, but also to try to find out something more about the connection of the Karakoram and Aghil mountain ranges and their continuation eastwards.

Our expedition was composed as follows: Dr. Ph. C. Visser, leader, glaciology, meteorology; Mrs. J. Visser, botany; J. A. Sillem, zoology; Dr. R. Wyss,

[1] *Note by the Editor:* This passage must not be taken as committing the Society to any opinion on a much discussed question of Himalayan nomenclature.

geology; Franz Lochmatter, mountain guide; Khan Afraz Gul Khan, surveyor; Muhammad Akram, surveyor.

Owing to the long distances which had to be covered our equipment was very voluminous, so that when leaving Leh we had to take with us not less than 445 coolie loads. We therefore made use wherever possible of base camps, the coolies generally having to cover the various stages once, twice, or three times to bring our provisions from one base camp to the other. On our marches through the high mountains we usually managed to limit the number of coolies to thirty or forty, travelling as lightly and quickly as possible.

We left Srinagar on 2 May 1929. I need not describe the much-travelled route from Srinagar to Leh *via* the Zoji La. I would however like once more to draw attention to the said pass which offers a typical example of retreating erosion, in this case of the Baltal river which runs southwards and is an affluent of the Sind river. Professor Dr. R. Oestreich gives an extensive and interesting description of this phenomenon. He also points out that nowadays the Zoji La is no longer a watershed, but that the Baltal river, lengthening its valley through the pass, now has its origin farther back, namely in Tibetan territory.

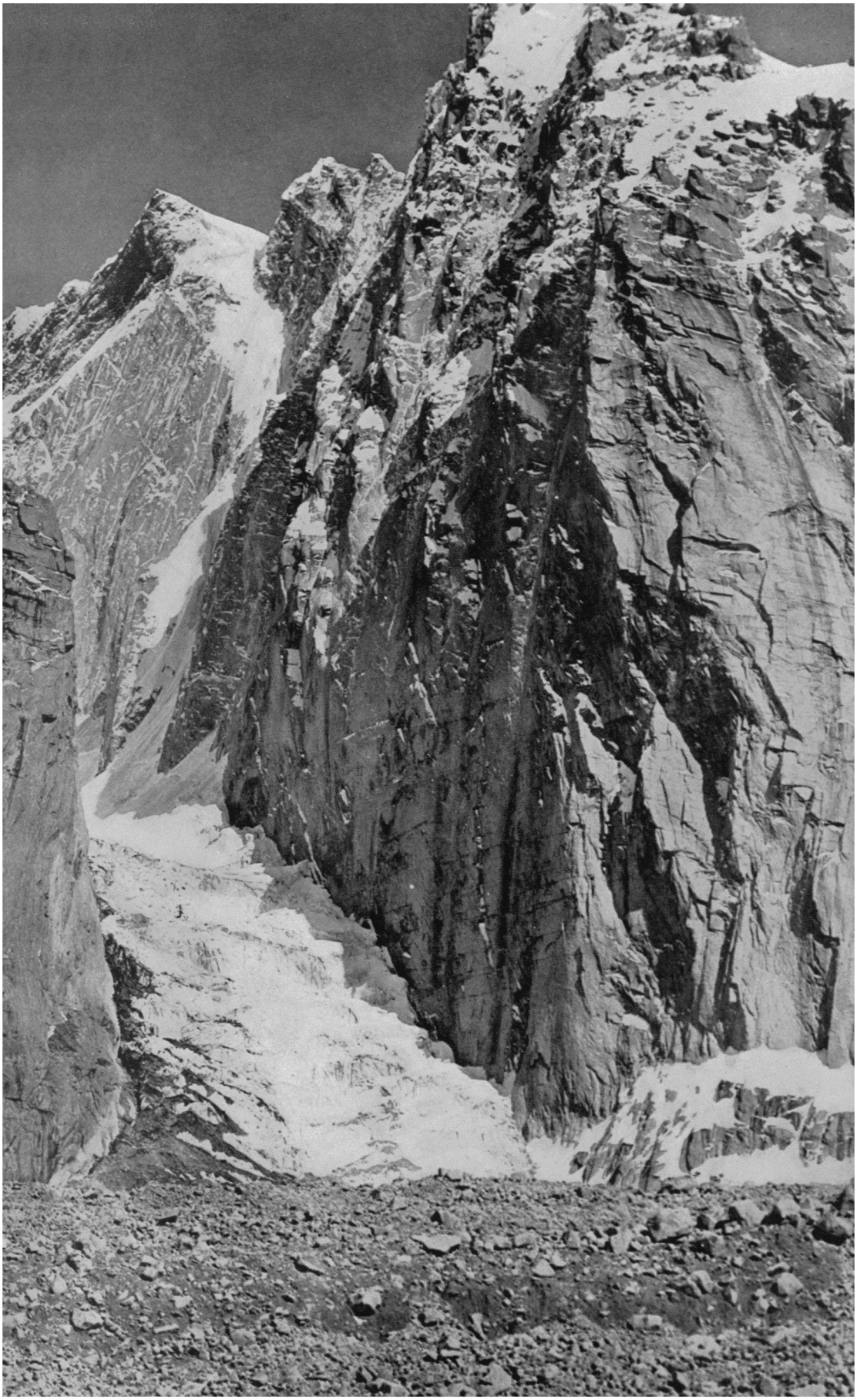
Probably there exists no mountain range forming such a striking frontier between two utterly different worlds as the Himalaya, because as soon as one has passed the Zoji La one enters into a landscape of quite a different character, with new mountain formations, with a new population, a new flora and fauna, and a new climate.

On June 2 we left Leh for the Nubra Valley, passing over the Khardung Pass, which was still covered with huge masses of snow. In Panamik we established a base camp. The first difficulty was to reach the Siachen Glacier. Owing to the big quantities of melting snow, the Nubra river rises in early summer so high that the road becomes impassable. We would however, after having finished our exploration work, have to go back by this very same road. The risk would then be considerably greater. Our first aim was the exploration of three side valleys in the Saltoro-Karakoram at the right-hand side of the Nubra Valley, for which we divided the work. Dr. Wyss and I went up the La-yoghma Valley.

The Saltoro-Karakoram need not yield in any respect to the principal chain of the Karakoram. The glacier, filling up the valley, was lying enclosed between absolutely perpendicular rock walls of dimensions such as I had never seen before (Plate 1). On the left we saw a gorge, which looked narrow in proportion to the height of the walls, but as we approached, a glacier of very normal dimensions came into view lying in it. The aspect of the chief range was also surprising, when suddenly over the curve of the glacier we saw it before us, for there rose up in the dazzling light, surpassing the keenest imagination, an obelisk of such impressive and daring build, of such harmony in lines and colours, that we were completely overpowered by it. It was a Matterhorn, the likeness of the most wonderful of Alpine peaks, but then a Matterhorn of nearly 23,000 feet. It was of a yellow brownish colour, covered with powdered snow, from its sharp point down to its foot, which sank away into an ice lake. Beside it another giant was standing, broad like a Grande Jorasse (Plate 2).

Most of the glaciers in the Saltoro-Karakoram range show the curious

Plate 1. The La-yoghma Valley, Saltoro-Karakoram



glacier type, where the firn-field, as we know it in the Alps, is completely absent. The feeding region is formed by a basin surrounded by steep rock walls, so that for the greater part the glacier is fed by avalanches. This glacier type has been very well described by Professor Oestreich and was named by him Muztagh Type. I would prefer the name Firn-basin Type.

On June 15, after numerous, often very difficult, fordings of the river and its side streams and a wearisome climb up the steep rock walls of the valley, we reached the Siachen. It is more than 46 miles long, being the second biggest glacier of Asia. We intended to explore the unknown region, which extends between this glacier and the watershed of the head chain of the Karakoram. As we did not succeed in finding a way into this region at the left-hand side of the Nubra Valley, the entrance had to be reached from the Siachen Glacier. We expected to find a side valley, filled up by a glacier, and we were quite surprised when, a few miles from the lower end of the glacier, we found a wide trough opening towards the east, in which a part of the Siachen flowed off. This glacier therefore possessed a second, though short, snout under which the broad stream of the valley disappeared. This valley was seen from the Siachen for the first time by Dr. Longstaff. It was the entrance to a majestic high mountain region with glaciers of up to nearly 16 miles in length.

Whilst Wyss and Khan Sahib climbed the Te Rong Glacier to map out its neighbourhood, Franz Lochmatter and I penetrated over the huge Shelkar Chorten Glacier into the high mountain range. We were accompanied by nine porters, stalwart men, for whom nothing was too much. They even agreed to go hungry so that we should be able to carry out our programme. The climb over the appallingly broken glacier was so difficult that we were often obliged to go by the very steep rock wall alongside the ice stream. To add to our difficulties the weather changed. It started to snow out of a dark grey fog. While we were making our way along the wall we heard all of a sudden above us something cracking and a noise of dull and heavy blows. The blows grew louder. I heard something whizzing past and saw enormous blocks flying through the air, apparently in the direction of the coolies. More blocks followed. It looked as if a granite fire had been opened on them. After the big blocks smaller stones came down, striking the rock wall. A dark cloud of dust spread like a haze. That could but mean a calamity. But to my surprise and joy I saw the coolies appearing out of the fog of snow and dust: two, four, then I counted seven, at last nine. None were missing, none were hurt. A marvellous escape.

In contrast with the glacier branch which Wyss and his party were exploring and which was lying in a deep valley, ending in steep rock walls, our glacier found its origin in a big firn field, surrounded by high snow mountains. In an eastern direction there was lying a kind of pass, so curved that the firn field, as it were, continued to the other side of the water-shed, where, as we discovered, it formed the origin of the ill-famed Chong Kumdun Glacier. This descends eastwards to the Shyok river. The ice dam blocking the valley has had disastrous consequences. From the firn field we ascended a snow peak of a height of approximately 20,350 feet. A majestic, dazzling white world was lying before us, a tremendous chaos of summits and mountain ranges stretching towards the horizon.

Plate 2. La-yoghma Glacier and the "Matterhorn" of the Saltoro-Karakoram

On our way back to Panamik we met with great difficulties owing to the water meanwhile having risen very high. We found that we could still visit the unexplored left- and right-side valleys of the Nubra Valley, so that our work fitted in completely with the explorations of our 1922 expedition (Plate 3). During our journeys through the broad Nubra Valley our attention was drawn to the distinct remnants of valley-terraces. I counted not less than seven of them, one above the other, of which the upper one was situated at about 2600 feet above the bottom of the valley.

The next object of our expedition was lying in the Karakoram valleys running eastwards, those ending in the Shyok Valley southwards of Saser Brangsa. During our journey to the Saser Pass Wyss availed himself of the opportunity to explore the only yet unknown left-hand side valley of Thalam Buti, which completed the exploration work of 1922.

In a certain sense the Saser is a curious pass. It is a long valley, filled for a great part with a glacier which, from the pass, flows away to the west as well as to the east. The highest point (17,480 feet) forms a scarcely noticeable curve in the valley.

The first side valley of the Shyok to the west led us into a grand and extensive glacier region which, especially from the glaciological point of view, gave us a rich reward. We discovered the East Chamshen Glacier, which finds its origin in the highest Saser Peak. In 1922 we had approached this same mountain from the west. The glacier was surely the most fantastic one I ever beheld. Its surface was covered with many hundreds of uniformly fashioned ice pyramids. Some of these reached a height of 150 feet. Especially towards evening time the sight of these weird ice towers was unspeakably beautiful. I will say something later on about this curious formation. Still more wonderful, almost overpowering, was the background, the enormous mountain circle from which this glacier flowed forth. Directly in front of us rose the highest Saser Peak. The summit itself attains about 25,170 feet. The wall of ice is nearly 7000 feet and reaches in one absolutely unbroken height from the glacier to the top.

We next visited a second right-hand side valley of the Shyok, to which we gave the name of Tughmo Zarpo Lungpa. It was difficult to enter the narrow gorge, and the fording of the wild mountain stream alone, although not wider than 7 feet, took us two and a half hours. It was only by throwing a rope across that we could manage to make the connection. Here again we found a mountain chain broken up into many valleys. The latter were strikingly narrow and very dangerous, owing to falling stones. Having completed the map of this part of the Karakoram we returned as soon as possible to Saser Brangsa. The danger threatened of the breaking of the dam in the Shyok Valley. A lake had formed behind the Chong Kumdun Glacier. As we learned later from Ludlow, one of the members of the special expedition sent by the British Indian Government to investigate the situation, it had a surface of not less than 65 square kilometres with a maximum depth of 122 metres. From these and other details I calculated that the capacity of the lake was about 3,750,000,000 tons.

Over the Depsang Plateau (which has been described already many times)

we travelled to Daulat-beg-öldi in order to start from there our journey into the unexplored, high mountain desert, extending eastward from the Karakoram Pass. The pony transport was sent over the Karakoram Pass to Suget Qaraul. It was in Daulat-beg-öldi that on August 16 at 5 a.m. I was awakened by a far-away noise as of thunder: heavy blows were heard in between. Khan Sahib thought the Kumdun Glacier was breaking, and, as it appeared afterwards, he was right. From a distance of 19 miles the noise had come to us over the mountains.

Through the first true right-hand side valley of the Chip-chap Valley, namely the Lung-nak Lungpa, we turned into our territory. I wrote down in my diary: "A wide valley, bounded by mountains with rounded forms. The slopes are of a light brown colour and enormous sand masses are heaped up at their feet. It looks like a mountain land in the last stage of its existence, for a great part collapsed and pulverized, weatherbeaten to sand and dust. Weary and decrepit the mountains are lying around us." No snow was to be seen. There grew no grass, no flower, no bush nor tree on this barren soil.

These Aghil mountains, eastward of the Karakoram Pass, show a very typical landscape belonging to an arid clime. Owing to the big differences in temperature during day and night a very heavy disintegration can be noticed everywhere. The finer particles of these weathered products are swept along by the storms and, especially during depressions, are set down again. But also the occasional showers of rain have brought down the weathered products from the ridges and slopes into the valleys. There are however no brooks or rivers to carry them off. Thus a continual levelling process takes place, owing to which the relative heights diminish constantly, the slopes of the mountains losing in steepness and all striking, sharp forms disappearing, until at last the landscape is formed as Hedin and others have described in the case of Tibet and as we also found it in the region mentioned above. Such regions in Tibet and surroundings are often described by the term "high plains." I prefer however the name which Drew gave to such landscapes, namely "high-level valleys." We soon had a surprise. Following the stream running through the Lung-nak Lungpa, we found after some days that this had its origin in a glacier. It was a small glacier to be sure, but a glacier all the same.

We found that our coolies after several days seemed to be suffering from the influence of the thin air at 16,500 feet and higher. Another unpleasant occurrence was the storm that regularly got up in the afternoon. It was not an ordinary storm, but a sandstorm, often so severe that the fine dust was hanging like a heavy fog in the valley, penetrating into our tents, our cases, our instruments, and even into our eyes, causing a disagreeable pain. The absence of water also made itself felt now and then.

A lonely mountain group rose in the centre of this region. The steep peaks reached to about 21,070 feet. One of these mountains was formed like a symmetrical table mountain, the others looked like the Tibetan *chortens*, the holy monuments of the Lamas, so that the coolies at once gave them the name of Chorten. As nobody would have expected snow or ice in this dried-up country we were very surprised when also in this central mountain group we discovered small glaciers. We approached this group through river-beds

which were dried up and which changed more and more into impressive canyons, with steep, terrace-formed, red-brown coloured walls.

The ascent of the highest peak now became the pinnacle of this part of our expedition in the real as well as in the figurative sense of the word. The first part of our journey took us through a very narrow gorge to the glacier. We made camp at its side at a height of about 19,000 feet. The further ascent took place along the rather steep hanging glacier to a col to the east of the peak. From there Lochmatter found much work to do, because the steep ridge, formed with an overhanging snow ridge, proved to be for a great part of hard ice, in which a few hundred steps had to be cut. Slowly but surely we climbed upwards until suddenly we could look out unhindered over the remarkable country through which we had been passing during the last few days. Far away to the south-west lay the grand white wall of the Karakoram, and in the opposite direction we saw the snow-covered mountains of the Kunlun, standing out sharply against the blue sky. That day for once the storms did not roar. There even was no wind at all. For us, Netherlands expedition members, there was still another fact which gave reason for joy, because our ascent took place on August 31, the birthday of our Queen. The highest part of the mountain was free from snow, and Wyss struck off with his hammer the very highest top. It proved to contain signs of marine fossils.

The watershed between the Chorten Thang and the Kushku Maidan is formed by a mountain chain, the Kara-tagh—Aghil, which at the northern side is covered with several small glaciers. Small though they are, one of them has a length of nearly a mile. This northern side, in spite of its greater height, gave me a strong impression of a range of dunes, such as we see from the shore of the North Sea. For a great part the melting water of the glaciers disappears immediately into the sand, so that often it was very difficult to find drinking water. The lakes which we found here, having no outlets, were salt. Especially beside such a lake, with the white, slightly curved mountains in the background, the landscape had an undeniable charm. The snowstorms, which almost regularly started every afternoon during the last week of our journey, were unpleasant, the temperature then sinking to 14° F. It was curious how difficult it proved to be to estimate distances in this country, without trees, houses, or people, which could serve as a point of comparison. Thus it happened that we stood before a lake (the Tso-rul Tso) thinking that its opposite shore was at some minutes' distance, while it actually took us more than one and three-quarter hours before we reached it.

On September 14 we hit upon something that looked like a trodden track and beside which we discovered an old camping-place. The supposition that this path led to the Kawak proved to be right. The next day indeed we reached the pass, from where suddenly the aspect opened out upon the Kunlun, one of the longest and also geologically one of the most important mountain ranges of Asia. The descent was quick, because everybody wished to get away from the bleak heights, where we had lived for more than four weeks at an altitude between 16,500 and 21,500 feet, all of us wishing to escape the bitter cold of the approaching winter, which we already experienced.

In this valley, where for the first time for fifty-four days we saw again the cheerful green of vegetation, we met some Kirghiz, who received and enter-

Plate 3. A rose-bush in the Nubra Valley

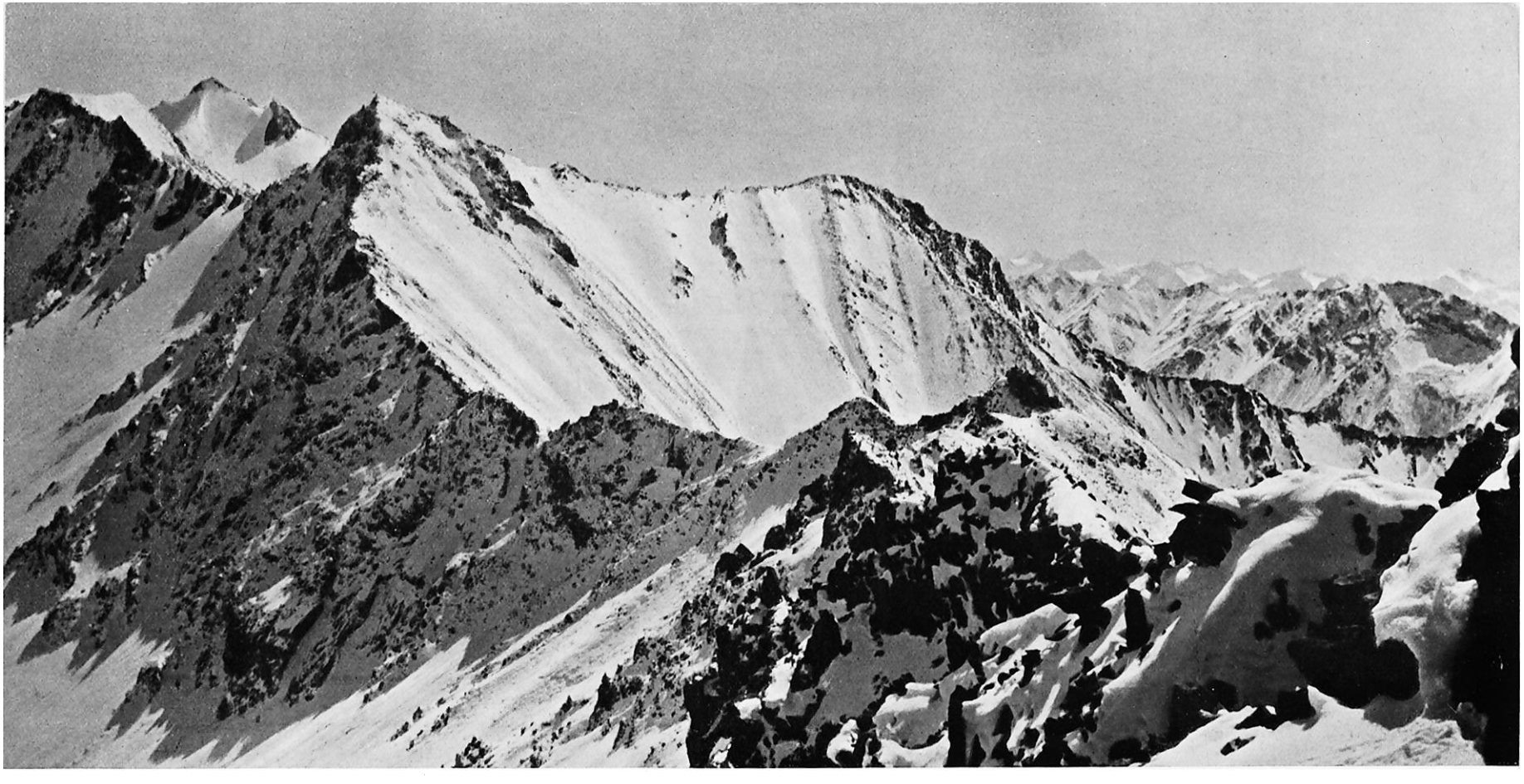


Plate 4. The Sanju Kunlun from above the Sanju Pass

tained us very kindly. The settlement was lying near the Karakash Valley, through which we journeyed farther until we reached the lonely Chinese military post of Suget Qaraul.

The Sanju Pass was already under a thick layer of winter snow. On the way up we made the acquaintance of the tremendous gorges of the Kilian Kunlun. They terminated in a snow-covered rock cirque, through which a steep ice-covered zigzag path led upwards to the Sanju Pass. This pass is hardly 4 feet wide and is between steep rock walls so that one gets the impression of stepping through a gateway from one world into another. There was nearly 10° of frost, and much wind. But the sky was blue and the landscape wide and of great beauty, pure white under the fresh-fallen snow of the last days. The scenery was so attractive that Lochmatter and I followed the graceful rock crest westward of the pass to a beautiful sharp peak. The crest now and then was so narrow that I worked myself upwards sitting astride. Progress was slow, as the rocks were covered with snow and the icy wind penetrated through everything, so that hands and feet had a hard time. But once on the top our efforts were well rewarded. We sat there in the midst of a bright sky and a dazzingly pure earth. To the south were lying the giants of the Kunlun, through which like a transparent line of clouds the white mountain land could be seen which some weeks ago we had crossed. To the north the dark mountain and hill ridges of Chinese Turkistan were lying, and behind these, far away under a bluish haze, I supposed the mysterious Taklamakan Desert to be, where an old civilization lies buried under the sand, here and there brought to light by Sven Hedin, Aurel Stein, Grünwedel, Von le Coq, and others (Plate 4).

I can conveniently omit the description of our journey through Chinese Turkistan to Yarkand and Kashgar (Sillem undertook a journey to Maral-bashi). But many before us have written down already their impressions. Our chief object there was to pass the winter. Wyss profitably used his time during our stay in Yarkand for geological work, while Sillem considerably extended his zoological collections. Meteorological observations also took place regularly.

The journey from Yarkand to Kashgar and again back to Yarkand was undertaken by us in the middle of the winter. On the way back the temperature fell to —22° F. On the other hand the weather was particularly fine. Especially on the second day after our departure from Kashgar, when we rode out into the endless Taklamakan Desert, all white with snow. It was a morning of infinite light, of soft colours and transparent mists flowing together. Suddenly we saw in the west white mountain-tops, hanging like white clouds high above the horizon, floating as it were on that foggy haze, between the white earth and the bluish white sky. This was the Muztagh Range with its mountains up to 25,500 feet, which rose up to nearly 21,500 feet above the desert. Until noon this vision stayed in the sky. Then it disappeared, like a mist evaporating almost imperceptibly.

On 27 April 1930 we left Yarkand, reached Khotan after ten days, and turned from there to the west again to go through the offshoots of the Kunlun to Sanju. It was a disconsolate, deserted mountain region, barren of all life,

with nothing but sand and rocks. Through the big, wide valleys and over the almost endless high lands the wind was sighing and roaring. Like clouds the sand rose up high into the sky. Against this storm our caravan toiled, through the dried-up country, where not a drop of water was to be had.

From Sanju we followed the same route along which we had come to Alinazar Kurghan. This we made a starting-point for some explorations in the neighbourhood. Thus Wyss visited one of the unknown glacier valleys of the Kunlun chief range and the valley to the Karlik Pass, whilst I undertook the exploration of the Karakash Valley eastward of Alinazar Kurghan, at least as far as we could succeed in penetrating into the gorge. After some efforts I succeeded in finding out through a Kirghiz Chief that high over the mountains there is a path, by which one can avoid the spot where the river runs along a rock wall which descends straight into the water.

To our surprise we found a sunny, wide, and beautiful valley with patches of fresh green and arable land, with a biggish *serai* and some shepherds' huts. Some 3 miles farther on the valley bent with a sharp turn to the north. We followed the left side of the valley. On the whole the path was good. Now and then it practically stopped dead against very steep granite rocks. We then had to continue climbing until the path reappeared more clearly. The valley, surrounded by steep mountain walls, kept its character. At one moment my journey threatened to come to an untimely end, when we were forced to pass round a particularly steep rock wall by fording the river.

The second day, when in total we had marched nearly 20 miles, we reached the farthest point of our journey, where the river disappeared into a narrow cleft. We made our way back through a fertile northern side valley from where we re-entered the Karakash Valley by crossing a pass. This time we succeeded, although with much difficulty, in forcing a way along the steep walls of the valley near Alinazar Kurghan. Our intention was now to reach the Shyok Valley *via* the big caravan route and over the Karakoram Pass, in order to continue the work which we started there in 1929.

That journey was to be a series of misfortunes. From the day on which we departed from Suget Qaraul the weather changed. Rain poured down, soon turning into snow. Day after day it was weary travelling with a big caravan of ponies, mules, and donkeys over the more than 16,400-foot high Suget Pass and farther to Aq-tagh, where we hoped to find our caravan with provisions from Yarkand. On our arrival there we found no trace of our transport. The worst of all was that we had practically nothing to eat any more, neither for our servants and coolies, nor for our animals, so that we had to go back to Turkistan, in the direction of Yarkand, hoping to meet our caravan in time to save us. It was a dreary procession, which dragged itself through the barren mountain desert in which nothing was to be found. The biting cold pierced us to the marrow as we struggled against the snowstorm. In the huge snowfields our animals sank right up to their breasts. We had to drag them out ourselves and to spur on our listless pony coolies, so that at least they lent a helping hand. Thus it went on, until at last we met the eagerly awaited caravan. We at once retraced our steps, reaching, amidst continual snowstorms and piercing cold, the Karakoram Pass. This famous pass of 18,290 feet is situated among curious mountains, shaped with rounded forms.

From Murgo on we followed the way which at one time Oliver traced for the caravans, desiring to go directly through the Shyok Valley to Leh, thus avoiding the Saser Pass. This route has not proved to be of much practical use; besides, the condition in the gorge just before we reached the Shyok Valley near Kataklik was such that we could only bring our transport through it with great risk of life. It may be however that we missed the right way. Just near the Shyok Valley we met all our coolies, whom in 1929 we had sent home from Suget Karaul and who had now come to join us and enter into our service again.

In the Shyok Valley we noticed immediately a big glacier which from a side valley had shifted diagonally over the Shyok Valley and was not mentioned on any map. It had no doubt to do with an ice-flow which had made an extraordinary advance. We now divided the work again. Wyss would enter the next valley while Franz Lochmatter and I would try to explore the Sultan Chhushku Valley, that from which the above-mentioned glacier had appeared.

It was a steep, narrow valley, bounded by steep rock walls. The ice-flow formed a glacier fall, which we hoped to master in a few hours. As soon as we were on the glacier we were surrounded by gigantic ice monsters, towers, walls, and needles, which apparently stood upright in defiance of all the laws of gravity. Lochmatter cut steps to climb up and steps to get down. Or he cut holes for hands and feet along perpendicularly steep ice walls, often above bluish green glacier lakes, smooth as a mirror. Many mountain climbers consider Lochmatter to be the best ice man of the Alps; on that day he beat his own record. Hours followed hours and still we fought our way through the ice chaos. Especially for our fourteen coolies the way was extremely difficult; the more so since the mystery of the ice world with its pitiless hardness influenced their simple minds, and the rushing and roaring, the thundering and beating of the unseen water in the clefts, and the noise of the ice pinnacles crashing to pieces spoke a strange and threatening language. Even I thought the limit had been reached in this sérac wilderness, the like of which I never had seen before on my countless journeys in the Alps, Norway, Caucasus, or Karakoram. The porters followed us with incredible courage, not grumbling for a moment, with child-like trust in the strong figure of Franz Lochmatter, who inspired confidence in all. Now and then he had to shake them vigorously so that their dazed and anxious thoughts returned to the necessary work of the moment. He had to push them sometimes as he let them down with the rope along the steep ice-walls.

It became afternoon. Without taking rest we toiled on slowly, to the unceasing sound of Franz Lochmatter's ice-axe. . . . It became night. But the goal was not yet reached. Looking for a bivouac place we found a small corner between the ice pinnacles and clefts on which the tiny tents of Franz and myself could just stand. The coolies threw down their loads and began removing the stones from the ice to make the floor somewhat even. Then they helped Franz to prepare a simple meal (Plate 6).

After they also had eaten I called one of them who had a flute in his belt. He played a strange, melodious, sad tune, while all the coolies squatted round my tent. The musician played his song until darkness came and the coldness of the night had put to silence all the water-flows and streams on the ice, so that

only the mysterious music of the player was heard between the séracs. An enchanter this player was, who chased away the evil mountain spirits, carrying our coolies over the glaciers and mountains far away to the small huts in the Indus Valley, in which they lived and were happy.

At last they rolled themselves in their blankets and slept.

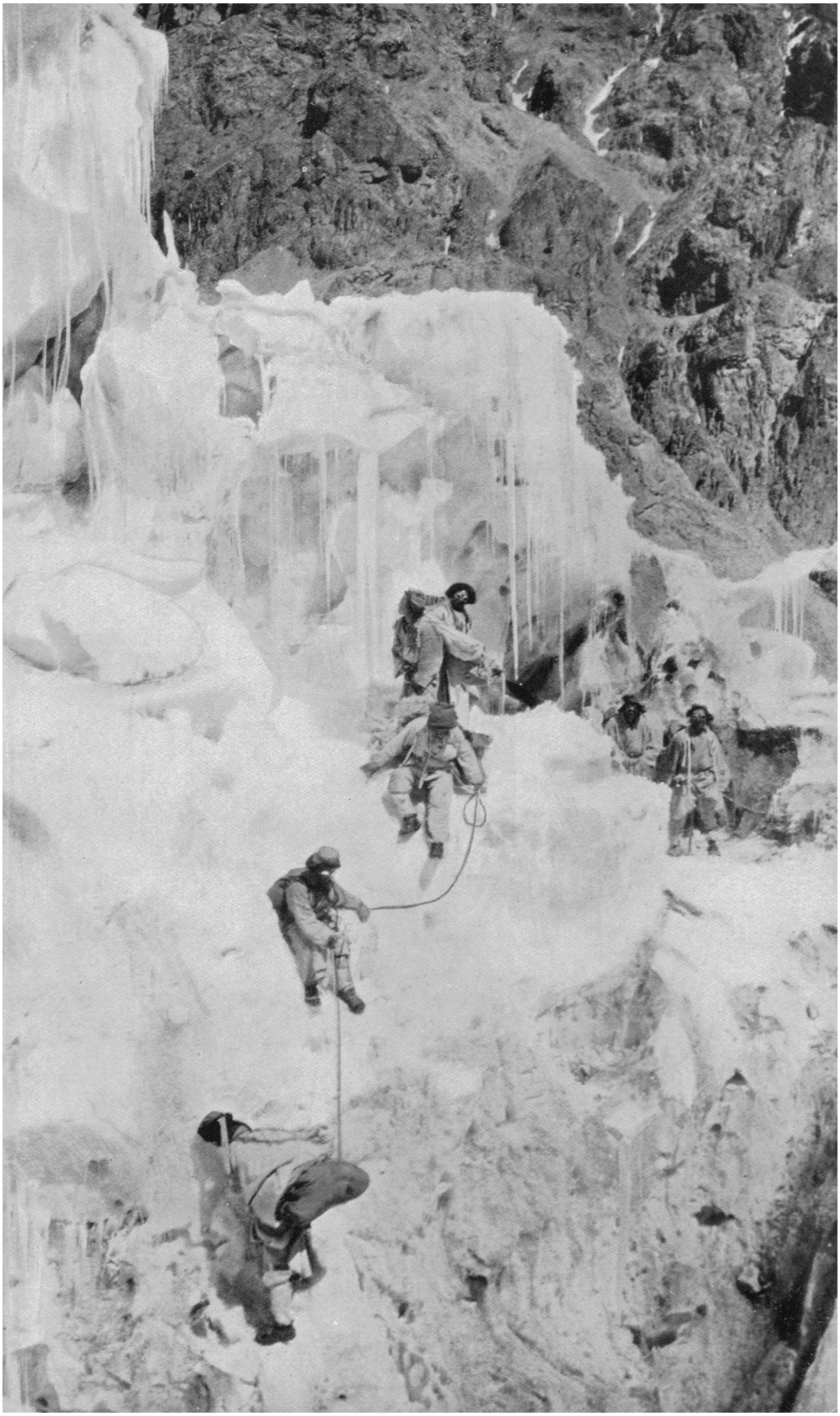
Hardly had twilight appeared the next morning when we were on our way again (Plate 5). Still higher the ice masses towered up around us; still more numerous were the wide clefts that forced us to take the most extraordinary roundabout ways. Still more threateningly the towers were hanging above us. Like an oppressive dream the thought haunted me, that we might be forced to go back the same way. Only late in the afternoon, under the continuous threatening of overhanging séracs, Franz let us down with the rope one after the other into a kind of *Bergschrund*, under continuous danger of falling stones, from which in nervous haste we reached a secure spot in the rocks. After more than thirty hours we had mastered the glacier fall, had succeeded in crossing the glacier, and had arrived in the heart of the high mountains, far enough to get a good view and to map out our glacier valley.

We all agreed on one point, namely that on no account would we return through the glacier fall. So that nothing else remained but to pass the ridge and to descend into the next valley, which would probably be that of Wyss. We could but hope that there we might find an easier route. The next morning at daybreak our caravan was already in the very steep couloir, through which we wished to reach the ridge. The greatest speed was necessary, before the sun would make its influence felt and the stone avalanche start. Never before had I seen our caravan climb with greater speed. Stones loosened themselves, flying closely past us. Franz cut as hard as he could, and without a single accident we reached the ridge and looked down into the next valley. With a shock I noticed that here we could not think of descending. We climbed farther along the ridge to a small peak of 17,000 feet, situated more towards the west. The tension about the question how we should find a way out relaxed a moment as we took in the beauty of this wonderful country of mountain giants.

We went on to a next gap in the ridge and from here we managed to reach the valley through steep couloirs, continually threatened by the stones, which whizzed around us. Our task was finished, for there was no doubt but we were in the glacier valley in which Wyss was working. The same evening we returned without difficulties to the Shyok Valley to descend farther in company of my wife and Sillem to the entrance of a side valley situated more to the south.

There was still one great problem which we wished to solve before the rising waters of the Shyok river prevented us from going farther, as they very soon would. We had continually hoped to be able to reach the highest Saser Peak from the south-east through one of the side valleys. The snow of its east and south slopes had to be disposed of by glaciers, and none of the two valleys which we had explored in 1929 had, even approximately, brought us into the neighbourhood, the south-east side, of the highest peak. On our way to solve this problem we were joined by Wyss, who, fully satisfied with his work, had just returned.

Plate 5. On the way up the Sultan Chhushku Glacier



We soon saw such a huge mountain stream, rushing forth from the valley which we were going to explore, that no doubt was left but that it came from a very large glacier territory. The hope was revived that we would now have a chance of solving the last big problem in these parts of the Karakoram. The second day we saw how this Shukpa Kunchang Valley divided itself into two other valleys, running more or less parallel. We decided first to explore the northern one, and after that, if possible, the southern one; if possible, because it became clear to us that it would be doubtful whether we would succeed in finding a place to ford the roaring, wide stream.

The northern valley narrowed down to an exceedingly grand gorge of enormous dimensions, above which high snow mountains sparkled. Luck was again with us, because just at the place where it proved to be impossible to continue along the true left shore, we found a thick snow bridge, lying across the stream, the remainder of a big avalanche. Along the right shore we reached, the third day after our departure from the base camp, a glacier of very big dimensions, and soon afterwards, when we had so far ascended over the ice that a free view was possible, it became clear to us that we stood on the long-expected ice stream which must have its origin in the south-east wall of the highest Saser Peak, rising up just before us although far away.

The stock of provisions would not allow of a large number of persons remaining long in this place. I therefore decided that only Wyss with a small number of coolies should carry on the exploration, while we would return to the Shyok Valley, then to go in the direction of Leh with our chief caravan. Our pony division had been sent on already.

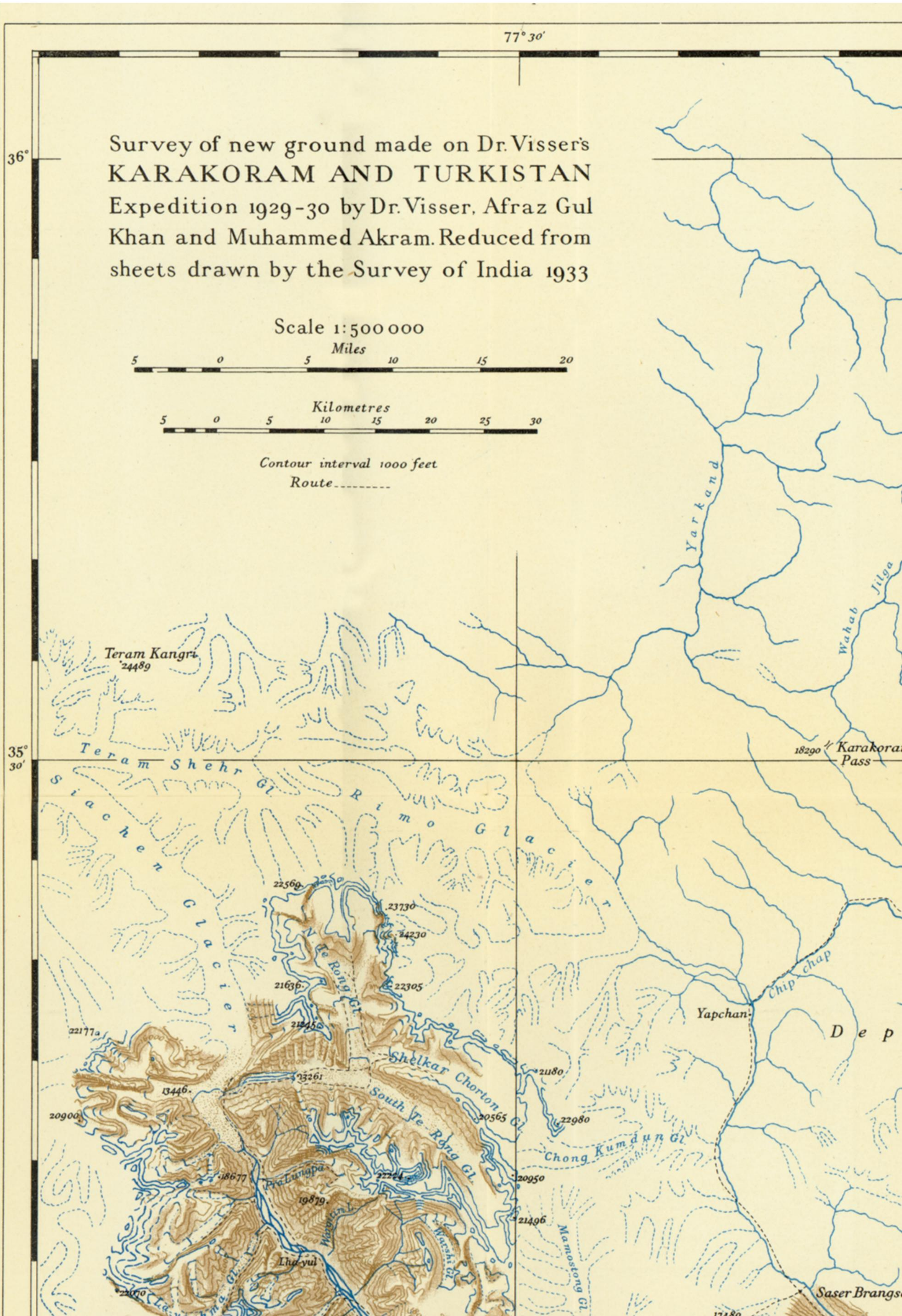
In the Shyok Valley we learned that owing to the high water our transport had not succeeded in descending the valley along the Shyok, so that they had been obliged to return with their already over-tired animals to reach Leh by the Saser Pass and Nubra Valley, a roundabout way of about 60 miles. We too were now forced to go the same way. Even then our difficulties had not come to an end. In Panamik we were informed that the two boats which in summer are stationed near Thirit to bring the trade caravans over the Shyok had been swept away and smashed against the rocks by the flood which had occurred in consequence of the bursting of the Chong Kumdun Glacier. In order not to have to wait, perhaps for many weeks, we crossed on a raft, made of hides, while our ponies followed, swimming. Our last trial was the soft snow on the northern slopes of the Khardong Pass.

In the middle of August we reached Srinagar, soon followed by Wyss and Muhammad Akram, who had brought their work to a brilliant conclusion.

DISCUSSION

Before the paper the PRESIDENT (Admiral Sir WILLIAM GOODENOUGH) said: When some two years or more ago this Society was privileged to award Dr. Visser the Back Grant he at that moment, or very close to it, was on his way to continue his investigations in the regions of the Karakoram. The award was made for the admirable work done by the expedition of which Dr. Visser was the leader, most ably seconded by Mrs. Visser and supported by that well-known surveyor, Afraz Gul Khan; a Swiss geologist, Dr. Wyss; and a country-

Plate 6. Camp on the Chhushku Glacier: cooking supper


77° 30'
36°
35° 30'
Survey of new ground made on Dr. Visser's
KARAKORAM AND TURKISTAN
Expedition 1929-30 by Dr. Visser, Afraz Gul
Khan and Muhammed Akram. Reduced from
sheets drawn by the Survey of India 1933
Scale 1:500 000
Miles
5 0 5 10 15 20
Kilometres
5 0 5 10 15 20 25 30
Contour interval 1000 feet
Route
Yarkand
Wahab Jilga
Teram Kangri
24489
18290
Karakoram Pass
Teram Shehr Gl.
Siachen Glacier
Rimo Glacier
22569
23730
24230
N. Te Rong Gl.
21636
22305
21245
22177
Shelkar Chorton Gl.
23261
South Te Rong Gl.
21180
13446
20900
20565
22980
Chong Kumdun Gl.
18677
Pra Lungpa
22224
20950
19879
21496
Mamostong Gl.
Lha-yul
Yapchan
Chip chap
Dep
Saser Brangsa


77° 30'
78°
on Dr. Visser's
URKISTAN
ser, Afraz Gul
Reduced from
of India 1933
15
20
25
30
Malik-shah
15200
Chibra
Yarkand
Baksum-bulak
16720
Wahab Jilga
Kara-tagh
Tso
Kara-tagh Pass
17710
Kara-tagh Sa
Chorten Lungpa
Chorten
Chorten
Thang
Tokhtari
Tokhtari Lungpa
Samar Lungpa
Karakoram
Pass
18290
Daulat-beg-oldi
Lungmuk Lungpa
Chip chap
Yapchan
Depsang Plains
Kizil Lunga
16400
Chong Kumdun Gl
Mamostong Gl
Saser Brangsa
Glacier
18761
19152
20521
20409
20049
20428
17245
20990
20587
18556
20660
19358
19704
20140
17246
18928
18808
19776
19460
19455
19518
21180
20565
22980
20950
21496


78°
78°30'
36°
35° 30'
18761
19880
19534
18348
Malik-shah
15200
Chibra
Chumit Thang
Chumik tsaka Tso
19152
18668
Tso La
Tso-rul Tso
18000
Kashku Maidan
16716
21190
Tso-rul La
Gyabshan Thang
Gyabshan La
20800
Kara Kash
Kara-tagh Tso
20005
Sumnal?
20521
21578
sum-bulak
Kara-tagh Pass
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Kara-tagh Su
Yamar Lungpa
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Shu lungspo Thang
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ang Plains
16400
Kizil Lunga
Shinglung
17030
Kash

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KARAKORAM AND TURKISTAN

Visser

man of Dr. Visser's, Mr. Sillem, as zoologist. To-night we are to hear of the third expedition that Dr. Visser has made to the Karakoram. He made a short expedition in 1922; in 1925 he led the Hunza expedition which I have mentioned; and thirdly, he led the expedition of which we are to hear this evening, when he surveyed and will describe to us the country between two rivers, the Nubra and the Shyok, comprising what are known as the Nubra peaks. We are eager, Dr. Visser, to hear what you have to say, an eagerness which I will interpret by asking you at once to begin your address.

Dr. Visser then read the paper printed above, and a discussion followed.

The PRESIDENT: We have with us to-night one who was in those regions some years ago, Colonel Ruck, and we should be glad if he would say a few words.

Colonel O. L. RUCK: It is interesting to note the advance and retreat of a large glacier such as the Siachen. I was up there on an ordinary shooting expedition about twenty-two years ago, and camped by the snout of the glacier. I then had with me an old map drawn up in 1862 when Ryall, of the Survey of India, sketched the lower portion of the glacier. He had marked the position of the snout at the end of the glacier, and I found when on the spot again in 1909 that the glacier had advanced, roughly, 800 yards: that is, 800 yards in about fifty years, or 16 yards a year. I have seen the wonderful map the Vissers have made, and it seems to me that since 1909 the glacier has retreated about 140 to 150 yards: that is, about 7 yards a year. So the glacier appears to be retreating at a slower rate than it advances. Major Kenneth Mason told me that the slope of the glacier bed is so easy that it has a very slow rate of advance, and of course we can understand that, but it does show, I think, that the glacier will take about another ninety years to get back to the position it occupied in 1862.

Dr. T. G. LONGSTAFF: It has been a great disappointment to me this evening that I have not already had the pleasure of reading Dr. Visser's paper; like every wise lecturer here, he has not *read* a paper, but has given a lecture, which has been most delightful and interesting. There are several of us, including Major Kenneth Mason, who is now in India, who, when the paper is published, will, I hope, find three very interesting pieces of new work described, and in country which is extremely difficult to work in.

As Dr. Visser has said very little with regard to his new work it would perhaps interest some of those present if I said a word or two about it. First of all, there is the great chain of peaks running up to over 25,000 feet between the Nubra river on the west and the Shyok river on the east, a range of mountains which is apparently the main axis of the Karakoram, about 60 miles long. Now the first to go into the snows and get up to the glaciers on the western side were Arthur Neve and Tyndale-Biscoe in 1896. They went up the Panamik valley, up on to the glaciers, and reached a height of 21,000. Then in 1909 the late Captain Morris Slingsby and I, acting on Neve's advice, went up the next valley, the Popachhe Nala, to the north-east, but we were driven out of that at only 18,000 feet by a heavy snowstorm. I think Dr. Visser used our cache of firewood in 1922. Anyhow, Dr. and Mrs. Visser visited the western side in 1922, and last year I believe they visited both the western and the eastern valleys of this range and the glaciers on the eastern side, that is west of the Shyok river, doing quite new work. When we come to the eastern side of the great Nubra-Shyok divide, the great mountains of 25,000 feet, I believe Dr. and Mrs. Visser with the other members of the party are the only people who have ever set foot on any of the glaciers on that side. Of course those glaciers had been seen from across the river; they are indicated on the old maps which Colonel Ruck referred to, but I think I know the country well enough to say that the Vissers are the

only people who have actually visited any of these remarkably difficult glaciers on the eastern slopes of the Nubra–Shyok water-parting, and I look forward with the greatest interest to reading a fuller account of them.

There was one very interesting point that amused me. You know we were all taught in school that glaciers excavate valleys, and some geologists seem to think a glacier is like a marmot and has the power of burrowing into the ground. We have seen to-night that while glaciers no doubt are able to excavate valleys in the Alps, yet in the Himalaya they make an exception to this practice; they do not excavate the valleys there because the sun is so hot that the rocky sides of the valley melt the ice of the glacier and push it back. You will realize from that photograph how utterly impossible it is for a glacier to burrow like a marmot. But I suppose I should get into trouble if I suggested that valleys excavate glaciers!

The second new piece of work done by the Vissers is the exploration of the glaciers on the western side of the upper Nubra river. They are the first people to go on to those glaciers. Thirdly, we come to the Siachen glacier, where I went with my good companions Morris Slingsby and Arthur Neve in 1909. Limited supplies combined with the utterly unknown topography deterred us from attempting to force a way down the glacier. So in the following September I followed the Nubra river up to its source, with the help of Major D. G. Oliver, British Joint Commissioner at Leh. Proceeding up the Siachen glacier from its snout I found on my right hand, that is, on the eastern or true left side of the glacier, an unexpectedly ice-free valley opening out from the range between the Siachen and Rimo glaciers (*Geogr. J.*, vol. 35, p. 644).[1]

When Major Kenneth Mason read his paper on the Shaksgam he mentioned (*Geogr. J.*, vol. 59, p. 319) that Major Gompertz surmised that there must be a large glacier beyond the head of the Mamostong glacier (Murgistang of maps) draining into the Nubra and not towards the Shyok as Neve (*Geogr. J.*, vol. 38, p. 352) had assumed in 1908. It was in reference to this that I said (*Geogr. J.*, vol. 59, p. 330) " please proceed 5 miles up the Siachen and take the first turning to the right," to settle it. It is all very well for you to laugh, but the point of my remark is that that valley has been known and pointed out for a matter of twenty years, but the Vissers are the first to go there. That work was waiting to be done. There are many people anxious to conduct exploring expeditions, but they do not always seem to take the trouble to find out what is a good place to go to. I want to point out that Dr. Visser's expedition has done a very real piece of work. I have seen a very rough unfinished map of the glaciers—they had a trained surveyor with them so there is no doubt about the map—and I can assure you that the topography as laid down on their map is wholly different from the former conception of it. So that it is really an absolutely new group of glaciers that they have discovered.

Then there is another interesting point. Dr. Visser mentioned going up the Upper Shyok to the Kumdun and Aq-tash glaciers that block the Upper Shyok valley, making an ice dam. I was privileged to see a letter Mrs. Visser wrote from India in which she said that the big lake had re-formed behind that ice dam; so that there will be another bursting of the ice dam for the newspapers next summer. The amusing part of it is that the prophets have all said in print that there will not be another flood; that the floods are finished with. But Major Mason must have been very pleased to hear the news contained in Mrs. Visser's letter because he prophesied in print that the others were all wrong: that there

[1] On turning up this reference I find a misprint in line 21, where "north-west" should read "north-east." This "empty" valley is clearly indicated on the map to face p. 744.

will be a flood. When glaciers get into the habit of advancing, as they did here two years ago, they keep that habit up for a year or two, and then they get tired of it and retire up their valleys like good marmots!

Now, fortunately for you, the lecturer comes on to ground that I do not know: the country to the east of the Karakoram between the Karakoram Pass and that great high plateau which is so little known. When we see Dr. Visser's paper and results published in the *Journal* we shall find that he has done a very great deal more than he has told us of to-night.

The PRESIDENT: I am sure we should all like to hear Mr. Amery say a word or two of appreciation.

The Rt. Hon. L. C. M. S. AMERY, M.P.: I do not know that I have anything to say and I cannot, like Dr. Longstaff, add any personal or, at any rate, recent personal knowledge of that part of the world. It is well over fifty years since I last visited the Himalaya, and such climbing as I did then was not conducted on my own feet! I have had the privilege of climbing with Dr. Visser in the Alps, and I know from reading his works and papers what a really remarkable piece of new exploration he has done. He has worked with comparatively small caravans and has concentrated on steadily opening out an unvisited and unmapped part of the world, and I think that geographers are deeply indebted to him and to Mrs. Visser for the exploration they have done. I am sure we have all admired the wonderful photographs shown us to-night. I have never seen a rock-face like that tremendous rock-face shown in one of the photographs. Certainly it has been for the ordinary spectator a thrilling evening.

H.E. THE NETHERLANDS MINISTER: Those who have had the opportunity of following the last lectures before the Royal Geographical Society will realize the pride with which I mount the platform this evening. Since last November three Dutchmen have, through the generous hospitality of the Royal Geographical Society and the genuine conception the Society has of its real purpose, been able to read papers in this hall. The first was Dr. Vening Meinesz, who gave a report of a long voyage he had made in a submarine under the sea; then came Professor Thierry, who told us about the draining and the reclamation of the Zuider Zee, on the surface of the sea. Now comes my friend Dr. Visser, who has told us what he has done at an elevation of nearly 20,000 feet over the surface. I ask you, Mr. President, am I justified in entertaining the hope that the next Dutchman I meet here will tell me of a journey to the moon?

Joking apart, I want to give Dr. Visser the assurance, in my capacity of representative of his country, of our very legitimate pride in the fact that he is a son of ours. What you have done in those climates and in those rough countries, Dr. Visser, has contributed to the prestige of your Fatherland. I thank you most heartily for what you have done for Holland and thank the Royal Geographical Society for having secured your presence this evening and you for giving yourself the trouble to cross the North Sea again. During the triumphant tour that Dr. Visser is making through the eleven provinces of Holland he has not hesitated to come over to England because I know—and we understand it—he loves England and an English audience.

We have had, thanks especially to the Royal Geographical Society, a delightful evening. We have listened to a lecture full of the liveliness which distinguishes Dr. Visser: a most delightful lecture, in very correct English, in which I dare say he has even corrected a current English expression in so far as he has proved that to give some one "a Dutch treat" can sometimes also have a pleasant meaning.

The PRESIDENT: I am under a bounden promise not to ask Mrs. Visser to say anything, and that I must abide by. I am sorry to say that Sir Francis Young-

husband was not able to be present this evening and, as we know, Major Mason is in India. It therefore falls to me to wind up the evening and, on your behalf, to offer most sincere thanks to Dr. Visser for his lecture. As I listened to the story of those great heights I realized that the mountain is like the sea, an exacting mistress, but one ever ready to give her favours to those who woo her with great devotion. That, Dr. Visser, you have done with the greatest possible success.

I am very glad that Dr. Longstaff spoke of what the results of the expedition will be, for those we have only partly heard to-night. A review of all the work that was done under Dr. Visser's leadership by Afraz Gul Khan and others in the way of real mapping and geography is yet to come, and that we can assure you, Dr. Visser, is one of the things that we regard as the most important result of your expedition. Dr. Longstaff mentioned many other things which I am sure will show you how deeply appreciative all present are of the work you have done. The fact that he mentioned it, as he very often does, in that delightful skating over thin ice, when we all hope and expect he will say something very indiscreet and he does not, adds a charm that we admire.

You may have noticed that Dr. Visser said that wherever he went he was well received. After hearing him to-night we are not surprised. May I tell him and Mrs. Visser that there is one place where they will always be well received, and that is in this country, in this Society, and in this lecture room. With that I ask you, Dr. Visser, to accept on behalf of the Society not only our very sincere thanks, but admiration both for the work you have done and the extraordinarily beautiful pictures that you have shown us this evening. I must mention that Dr. Visser has come over to lecture to us to-night, arriving at half-past five this morning; that he is returning at 10 o'clock to-morrow morning to Holland, where he will lecture the same evening. I thank you, Dr. Visser, most cordially on behalf of the whole Society.

EVIDENCE OF RECENT CLIMATIC CHANGES SHOWN BY TIBETAN HIGHLAND LAKES

H. DE TERRA AND G. EVELYN HUTCHINSON (of the Peabody Museum and Osborn Zoological Laboratory of Yale University)

IN 1905 Ellsworth Huntington[1] observed that the Pangong Tso in Ladakh shows a set of benches and beach-lines which lie lower than any of the older terraces surrounding the lake. The latter, of which Godwin Austen in 1866 said that they must be witnesses of the Ice Age, have unduly diverted the attention of explorers from a less conspicuous but equally important feature: the erosive and bathymetric evidence of recent climatic oscillations on the Tibetan highland lakes.

During the summer of 1932 we[2] had occasion to spend several weeks in the immediate neighbourhood of the lakes Pangong, Pongur, Mirpa, Morari, and Kar in eastern Ladakh along the Kashmir–Tibetan boundary. Our geological and biological work provided, amongst other results, new information regarding changes of depth, of shore features, and related phenomena which bear witness to regional climatic oscillations of Post-Quaternary age. It may encourage those who visit lake shores to gather more data.

The evidence for recent changes of lake-levels is topographic, physiographic, and hydrographic. Data gathered by former explorers most fortunately record changes in level and in local precipitation in Ladakh reaching back over one hundred years, which had made it possible to compare these oscillations and to trace their origin.

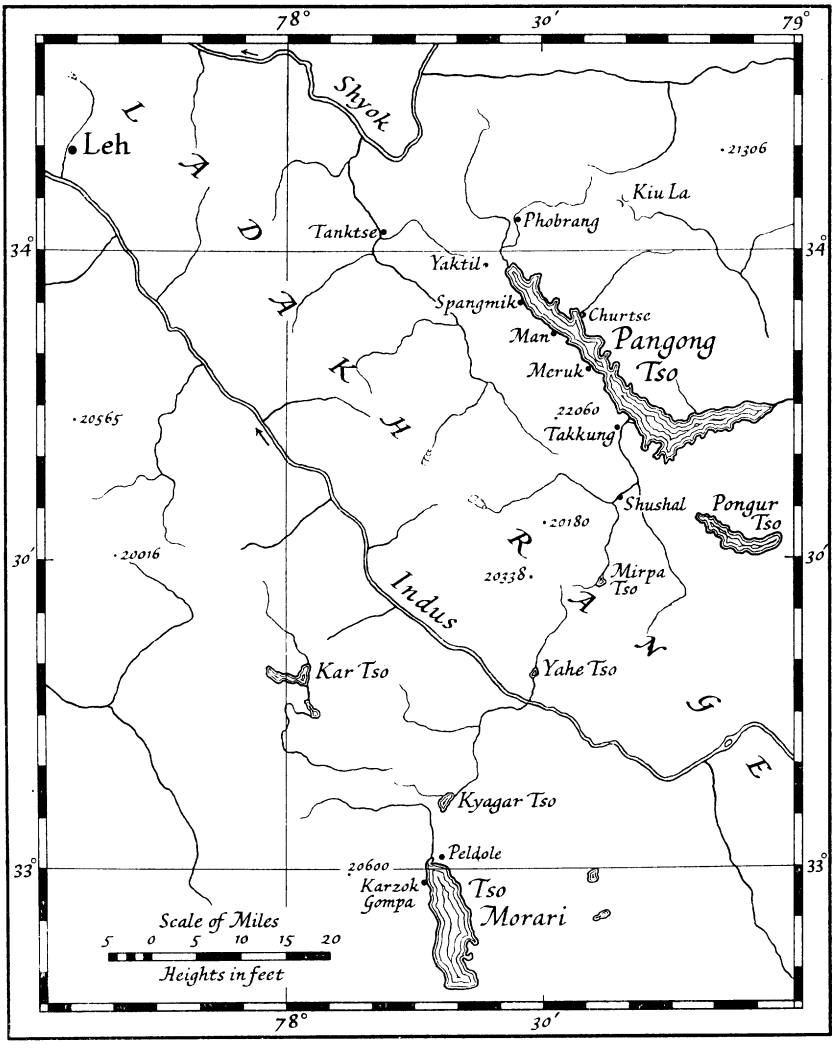
The Pangong Tso, being the largest mountain lake north of the Himalaya (13,915 feet above sea-level), gave the first evidence of recent topographic changes. When our pony caravan attempted to use an old path along the northern shore between Churtse and Lukung we found it impossible to proceed round the base of the cliffs as the path had become flooded. On the promontory which flanks the north-western part of Churtse bay the old path was found well constructed with large slabs of rock, and the road, which first follows a higher beach terrace, could be seen to lead into the lake, where the path continued 5 feet below the water and around the cliff. We noticed two drowned beaches at 3 and 5 feet which may also be recognized on Plate 1. Natives from the hamlet of Lukung corroborated the recent rise of the lake. At some previous date a path had been constructed through the rocks above the cliff, but this road had long been out of use, for we were warned that it had been impassable for years. Sven Hedin[3] however had been able to use it in 1901, from which we may conclude that the natives had since then con-

[1] "Pangong, a Glacial Lake in the Tibetan Plateau," *Jour. of Geol.*, vol. 14, pp. 599–617.

[2] Dr. H. de Terra was leader of the Yale University Expedition to northern India in 1932–33, to which Mr. G. E. Hutchinson had been attached as a biologist (see *Geogr. J.*, vol. 82, no. 4, 1933, p. 379; also *Himalayan Journal*, vol. v, pp. 33–45; and *Geographical Review*).

[3] 'Im Herzen von Asien,' Leipzig, 1903, vol. 2, p. 502.

structed the safer and shorter road along the base of the cliff which eventually had become flooded so that the northern shore road fell entirely into disuse. For this reason the northern trade and shepherd route from Tanktse to Rudok leads nowadays *via* Phobrang across the Kiu La. Our native guide stated also



that the outlet of the eastern Pangong near Ot had become unfordable owing to high water.

A few days later our surveyor, Khan Sahib Afraz Gul Khan, drew my attention to the fact that a rocky islet a quarter of a mile out in the lake from the shore at Yaktil which had been marked as lying 5 feet above the lake-level on the old survey sheet (27.13922′) did not now exist. Hutchinson set out for a line of soundings and found that the shallowest water was 13·1 feet at

the spot where the islet had been in 1861. Thus the lake had risen since then at least 18 feet.

As we proceeded from Lukung to Man and Takkung on the southern lake side further physiographic evidence for a recent rise presented itself. The fan formation which here makes the lake front is seen to be superimposed on the pleistocene deposits and is therefore of post-glacial origin. A young talus-cone at the slope of a cliff between Yaktil and Spangmik showed two distinct beach lines 3 and 5 feet above the water, and a third could be seen in the clear water 2 to 3 feet below the level of the lake. Shortly before reaching this spot the path makes a detour around the advancing water of a shallow bay. Beyond Spangmik several river-beds must be crossed, of which some are deeply entrenched into the fan, which is underlain by glacial and interglacial deposits. In some of the shallower flood channels a more recent heavy accumulation of gravel had taken place, so that the road had been completely obliterated. Former erosion naturally had entrenched the river-bed during a progressive fall of the lake-level until this process had recently been checked, if temporarily, by a rise of the water to which the rivulets had responded by accumulation.

Twelve miles south-east of Takkung the underwater beaches were seen to follow the contours of an old shore-line (Fig. 1). A small delta had here been

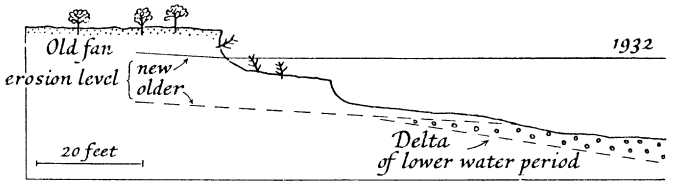


Fig. 1

built into the lake, and as the underwater beaches broke abruptly off along the drowned shallow flood-channel of the rivulet it is evident that the beach preceded the delta. Larger bushes could still be seen clinging to the upper beaches while others had already become uprooted and were tossed about by the waves. These had cut a cliff 7 feet high into the older fan deposit from which the vegetation was breaking loose. The two beaches in front of the cliff had evidently been made at lower water, and owing to a further fall of the lake a younger fan had then been formed in front of them. The rising lake water had then flooded these shore features until the lake is now cutting into the front of the older fan.

Another interesting physiographic change connected with the rise of the Pangong is the formation of small lagoons. They appear in parallel rows along the shore and in one place two could be seen at distances of 3 and 10 feet from the shore. Fig. 2 may illustrate how their peculiar arrangement can be explained by a progressive rise of the lake-level. Their formation is greatly assisted by preceding shore-ice action. The accumulation of gravel and sand in the form of ridges is a common feature along Tibetan lakes (Plate 2). Owing to the severity of the frost, which keeps the lakes solidly icebound during four or five months of the year, shore-ice is a much greater factor of accumulation

than around lowland lakes in middle latitudes. On Tso Morari I measured the beach gravel walls which were piled up by shore-ice to 4 feet high. Huntington[1] and Hedin[2] have pictured the same process. Such walls are found on many of the lagoons, but it is evident that they can survive a temporary inundation only if they consist of coarser gravel or of sand which has become somewhat cemented. During stage 2 of Fig. 2 Terrace A will become slightly hollow as the result of weathering, especially by deflation, whereby the height of the new beach wall is accentuated. Most lagoons on Pangong can be traced back to the same process; particularly where low terraced fans have become inundated, this indicates a recent rise of the lake-level.

There are also new data on soundings which lead to comparison with previous bathymetric work done by H. v. Schlagintweit in 1856[3] and Sven Hedin in 1901.[4] During our expedition soundings were made in the extreme northwestern end of the lake, in the vicinity of trig. station 27 of the survey of 1863, an islet now covered with water. One of these soundings, over the station, can be placed with confidence; the position of the others is very close;

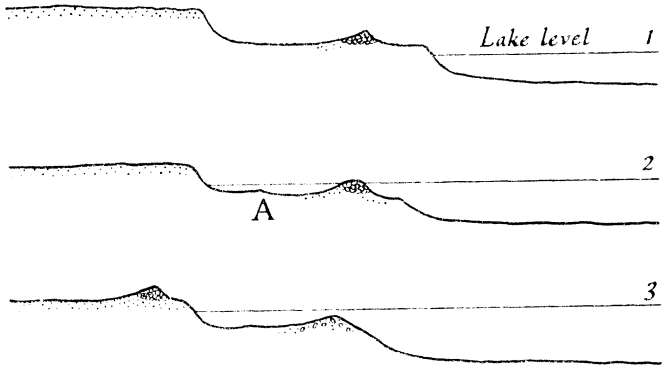


Fig. 2

the soundings near Man can be placed with fair accuracy, but several soundings to the east of Takkung can be located only roughly.

Hedin sounded the lake in 1901. He obtained one long line in the most southern part of the basin and another from Man across the lake to Churtse. The latter may be on nearly the same profile as ours, from which a rise of 15 feet between 1901 and 1932 can be deduced. H. v. Schlagintweit had obtained a maximum depth of 170 feet (51·4 m.) in the centre of the lake opposite Takkung. He also made two lines across the lake, one from Meruk, the other from Man. In the latter a maximum depth of 148·4 feet (45·1 m.) was encountered. When Schlagintweit's profile across the lake at Man is drawn, and the portion of the profile represented by our soundings then drawn below the older profile, the deeper of our soundings is found to lie just north of the central sounding of Schlagintweit's series. By comparing Schlagintweit's

[1] *Op. cit.*, Fig. 4.
[2] 'Scientific Results of a Journey in Central Asia, 1899–1902,' vol. iv, Stockholm, 1907.
[3] 'Reisen in Indien und Hochasien,' Jena, 1872, vol. 3, p. 172.
[4] *Op. cit.*, pp. 333 ff.

middle sounding of 140·0 feet (42·6 m.) with the point on our profile immediately below it, a rise of water-level of 19·4 feet (5·9 m.) can be deduced, and approximately the same rise is given when our deeper sounding is compared with Schlagintweit's profile. Our shallower sounding lies under a part of Schlagintweit's profile at which the depth is changing too rapidly to give any data of value. From a consideration of the present depth of the islet which was covered with water before 1859, it is clear that this figure of a net rise of 19·4 feet (5·9 m.) since 1856 is too great. In all probability the lines of Schlagintweit's soundings and ours do not exactly coincide. From the rate at which the island rose after 1859 we are probably justified in supposing that the lake was 10 feet (3 m.) shallower in 1856 than in 1932. Comparison of the areas of the profiles of 1856 and 1932 shows an increase of 18 per cent. corresponding to a rise of 19·4 feet (5·9 m.); since this is about the total rise between the minimum and to-day, we may assume an increase of volume of about 18 per cent. since the sixties of the last century.

The general correctness of the information obtained is however confirmed by a multitude of earlier observations all indicative of changes of the Pangong level. These historic data have been condensed in diagrammatic form on Fig. 6. For reference this list of historic data can briefly be summarized as follows:

1. W. Moorcroft and G. Trebeck ('Travels in the Himalayan Provinces of Hindustan and the Punjab,' London, 1831, pp. 401, 435) gave the first account of Tso Pangong and mention the lack of a road along the northern shore in 1821.

2. H. Strachey ("Physical Geography of Western Tibet," *Jour. Royal Geographic Soc.*, vol. 23, 1853), who visited the lake in 1848, remarks on the outflow of the eastern Pangong at Ot. His native guide, who had been with Moorcroft, said that the lake had perceptibly receded in the last twenty-seven years.

3. H. von Schlagintweit (*op. cit.*, vol. 3, pp. 168 ff.) relates native information according to which higher lake-levels in connection with good harvests were frequent before 1841. In 1856 soundings were made but no rock islet is mentioned.

4. H. H. Godwin Austen ("Notes on the Pangong Lake District of Ladakh," *Jour. Asiatic Soc. Bengal*, vol. 37, pt. 2, pp. 84–117, 1866) surveyed the rock islet in 1863 which appeared in 1859 above the lake-level. Shore roads were passable. He observed five to six beach-lines, 1 foot distant from each other, and also a submerged lake terrace, 10 feet below the 1863 level. From these phenomena he infers climatic oscillations.

5. In 1869 F. Drew ('The Jummoo and Kashmir Territories,' London, 1875) pictures the islet and mentions a total seasonal rise and fall of the lake by 3 feet.

6. M. S. Wellby ('Through Unknown Tibet,' London, 1898) had the choice to use either the shore route or the longer but safer one across the Poranda La.

7. Sven Hedin (*op. cit.*) gives soundings of 1901 and comments on the condition of the northern shore route which was inundated, but the river at Ot was fordable. The existence of an older road, 10 m. above the path which he followed, makes him believe that his road of 1901 was once flooded.

8. E. Huntington (*op. cit.*) observed in 1905 three to four small drowned beaches 10 to 12 feet below the level, and gives native information according to which the lake was 10 to 12 feet lower during 1875–85. Although he recognized that oscillations were recent he attempted to couple them with the formation of clay and gravel deposits near Man which Godwin Austen in 1866 had rightly interpreted to be of glacial and interglacial origin.

To this historic record must be added a chemical analysis of the lake water made for Henderson and Hume in 1871.[1] A comparison of the chloride content of the lake as given by him with that found in 1932 indicates that the lake has been diluted by fresh water by 16 per cent. of its former volume since that date. This increase in volume is comparable to the increase of 18 per cent. in area of the cross-section at Man indicated above.

The whole clearly indicates that within 112 years Tso Pangong has experienced one low and two high levels.

Tso Morari, in the district of Rupshu on the Himalayan side of Ladakh, presents indisputable evidence of a recent rise. The prayer or mani walls on the western shore between Karzok Gompa and Peldole were half washed into the lake when we passed there in August 1932 (Plates 3 and 4). The path

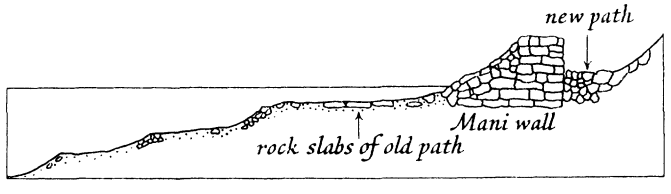


Fig. 3

did not bifurcate at the end of the prayer wall as it should, and the natives had started building a smaller mani 4 feet farther inland on the other side of the road. Plate 3 and Fig. 3 show the ruined state of this monument, and the drowned terrace across which one branch of the path led round the other side of the mani, as is required by lamaistic rite. The destruction of an older shore road became visible all the way. The people had in some places carried it across young talus 10 feet higher up. Three drowned beach-lines could clearly be seen under water as Fig. 3 illustrates, and from a higher location above the shore one could readily follow three or four of the drowned beaches all along the shore. Some lagoons occur in a beach, their spits lying 5 inches above the level. Strewn with coarse gravel and boulder they indicate a formation similar to the one formerly described. On the eastern shore also there is a drowned path 5 to 6 feet beneath the water which leads around a rocky promontory south of the plain called Titta.

Our soundings on Tso Morari showed that the lake was 160–165 feet (49 m.) deep, midway between Karzok and Peldole about 500 feet (150 m.) in from this shore. One of Drew's lines of soundings lies a little to the south, running

[1] Frankland, in Appendix B of Henderson, G., and Hume, O. A., 'Lahore to Yarkand,' London, 1873.

Plate 1. Pangong Tso: drowned beaches

Plate 2. Pangong Tso: accumulated gravel and sand

Plate 3. Tso Morari: prayer wall partly washed away

Plate 4. Tso Morari: remains of submerged prayer wall

due east from Karzok. Unfortunately it is not possible to make any comparison owing to the probable variation in the slope of the lake bottom in this region.

On *Kyagar Tso* a well-defined beach with a gravel wall made by ice-push was noticed 3 feet below the present level; within this are two less well-marked beaches. Drew found the deepest point to be in the south-west corner of the lake, where he ascertained a depth of 67 feet (20·4 m.). In the same part of the lake we obtained a depth of 69·6 feet (21·2 m.). It is probable that the water-level has risen about 3 feet in the last fifty years.

The small glacial lake, *Yahe Tso*, which is drained by a northern tributary of the Indus, showed one drowned beach at 6 feet and two others at a depth of 3 feet and 1 foot along the south-west corner. A sharp drop from the 3-foot contour at the north end of the lake may represent the second of these beaches. At the present the lake has an outlet, so large changes in water-level could not be expected.

Mirpa Tso is a glacial lake without outlet in a *kar* basin of the Ladakh Range south of Shushul. It presents drowned shore-lines at 1, 2, 3, and perhaps 4 feet. The former three are very conspicuous and can be clearly seen along the southern shore where there is also a larger set of higher and older shore-lines. The drowned beaches give here clearly the impression of being the youngest features resulting from continuous post-glacial desiccation which had been checked by the recent rise of the lake-level.

On *Pongur Tso* remains of a drowned beach, about 1 foot below the present level, were observed in several places along the western end of the southern shore.

During Dr. Trinkler's expedition in 1927 de Terra noticed a drowned river terrace at the eastern end of the Aksai-chin lake where a small river flows into it. The terrace is cut into clay deposits and was overstrewn with gravel, lying $1\frac{1}{2}$ feet under water. The lake shore showed a sandy gravel beach wall 1 foot high which lay on top of a drowned terrace 2 feet below the level.

Outside the region which is known to either of the authors the lake system of Manasarowar and Rakas Tal in Tibet gives a remarkable record of oscillations which have become known through various descriptions.[1] Until the middle of the eighteenth century Lake Manasarowar regularly flowed into Rakas Tal and the latter apparently into the Sutlej. Since 1804 the flow from Manasarowar into Rakas Tal has been recorded as intermittent and no certain records exist of water leaving Rakas Tal. The channel from Manasarowar is but a few feet above the lower level of the lake, and thus a small rise will suffice to convert the dry bed of the effluent into a river. Fig. 5 gives the record of observations available since 1804.

The Climatic Cause of the Changes in Lake-levels

As most of the lakes mentioned receive their water supply from glaciers or snow-fed rivers, it seems at first obvious to couple the recent rise of lake-level

[1] The last observations were recorded by Messrs. F. Williamson and F. Ludlow in 1932 (*Him. Jour.*, vol. 5, p. 103). See also Kashyap, *Jour. Asiatic Soc. Bengal*, N.S., vol. 25, 1929, and Sven Hedin, 'Southern Tibet,' vol. ii, Stockholm, 1917, pp. 171–188.

with an increase in the amount of melting water. In such a case we would expect to find widespread evidence of glacier retreat and possibly a rise in the snow-line. In the case of the Pangong lake basin however no trace of general glacier retreat could be detected. The numerous glaciers on the Pangong range south of the lake have irregular movements, and on the whole they seem at the present to be stationary so far as one can judge from topographic evidence. Mirpa and Yahe Tso have no glaciers in their immediate neighbourhood, and yet they also show drowned beach-lines. Another argument against an increased ablation is the fact that numerous patches of valley névé in eastern Ladakh have hardly changed their size in the last eighty-three years. Strachey[1] noticed one cake of valley névé in southern Rupshu 4–5 inches thick and several acres in extent, and another one in 1848 in the Mirpa Gongma which lies in the Pangong catchment area. The latter had, according to our observation, hardly lost in size and not at all in thickness. H. v. Schlagintweit[2]

Fig. 4

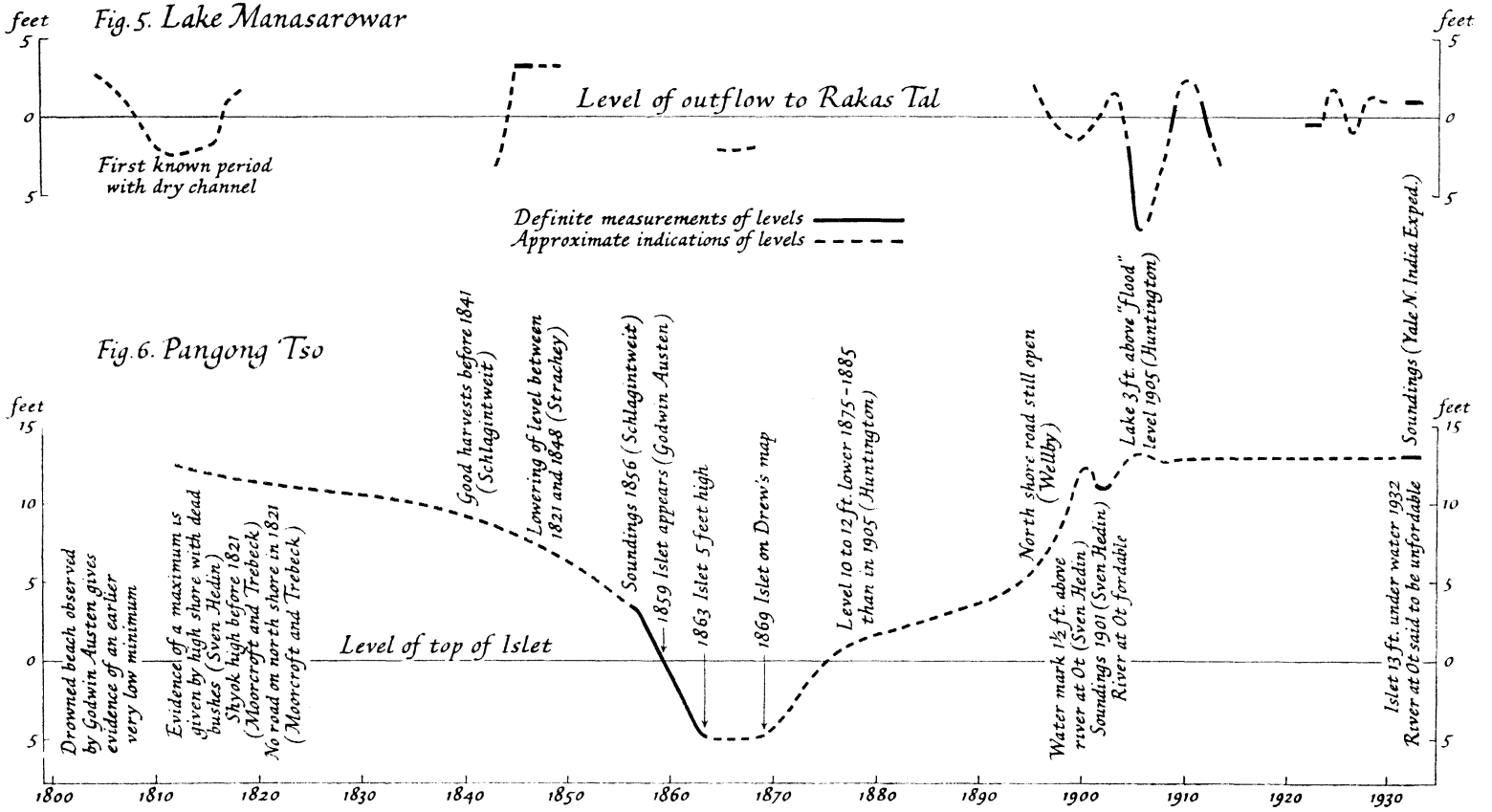
reported similar névé from the Aksai-chin in 1857 which Drew[3] rediscovered in 1870, and the 4 inches of firn, 1 mile long and a quarter of a mile wide, still seemed to exist unchanged. One would think that a slight increase in temperature or solar radiation would suffice to melt such isolated and unprotected névé. The recent rise and the previous changes of lake-level cannot be traced to an increased supply of melting water, and as the phenomenon as such is one of regional extent, it must be due to changes in precipitation.

The meteorological station at Leh, which is about 50 miles north-west from Pangong as the crow flies, has registered the rainfall since 1876. A comparison between Fig. 4, which gives the changes of rainfall and the curve, and Fig. 6, which illustrates the changes of lake-level at Pangong, shows that an increase in precipitation between 1890 and 1900 corresponds with a rise in

[1] R. Strachey, "Physical Geography of Western Tibet," *Jour. Royal Geogr. Soc.*, vol. 23, 1853.

[2] *Op. cit.*, vol. iv, p. 82.

[3] *Op. cit.*, p. 353.


feet
5
0
5
Fig. 5. Lake Manasarowar
Level of outflow to Rakas Tal
First known period with dry channel
Definite measurements of levels
Approximate indications of levels
Fig. 6. Pangong Tso
15
10
Level of top of Islet
Drowned beach observed by Godwin Austen gives evidence of an earlier very low minimum
Evidence of a maximum is given by high shore with dead bushes (Sven Hedin) Shyok high before 1821 (Moorcroft and Trebeck) No road on north shore in 1821 (Moorcroft and Trebeck)
Good harvests before 1841 (Schlagintweit)
Lowering of level between 1821 and 1848 (Strachey)
Soundings 1856 (Schlagintweit)
1859 Islet appears (Godwin Austen)
1863 Islet 5 feet high
1869 Islet on Drew's map
Level 10 to 12 ft. lower 1875-1885 than in 1905 (Huntington)
North shore road still open (Wellby)
Water mark 1½ ft. above river at Ot (Sven Hedin) Soundings 1901 (Sven Hedin) River at Ot fordable
Lake 3 ft. above "flood" level 1905 (Huntington)
Islet 13 ft. under water 1932 River at Ot said to be unfordable
Soundings (Yale N. India Exped.)
1800
1810
1820
1830
1840
1850
1860
1870
1880
1890
1900
1910
1920
1930

the lake-levels.[1] Since all the lakes of western Tibet appear to behave in a similar manner inasmuch as all seem to have risen recently, it is tempting, though perhaps fruitless, to speculate whether the pronounced lowering of the Pangong Tso during the middle of the last century may not be a manifestation of the same influence that has cut off Rakas Tal from its drainage to the Sutlej.

In the case of Lake Manasarowar Hedin has pointed out that a high level leading to a filling of the channel follows, at least in some years, a heavy snowfall. It is obvious that this lake must react more sensitively to such changes in precipitation than does Pangong Tso, for only a slight rise in its level suffices to produce a refilling of the river at its outlet, an event which is more striking and more frequently noticed by travellers than the temporary formation of beach-lines. Examination of the relatively complete data for the present century indicates that a very small fluctuation in climatic conditions is responsible for the flooding and drying of the channel.

Altogether it may be stated that the recent rise of the water-level in the lakes of Ladakh is due to increased rainfall. Such an increase of rainfall is, as has been shown by Brooks[2] for the thirty years prior to 1910, apparent throughout almost the whole of the temperate part of the Eurasiatic continent. This has a definite bearing on the question of the water supply in high Asia which is always quoted as if undergoing a process of continuous desiccation. That this is not the case may be inferred from the foregoing evidence. It is not improbable that in the long run desiccation might go on or that it might become definitely checked by a general increase in rainfall, but in either case it is a discontinuous process.

In view of the fact that this region borders on one of the most glaciated mountain regions on earth, namely, the high Karakoram, it is inviting to compare our figures with those given by Mason[3] for the movements of the Karakoram glaciers. The Chong Kumdun glacier, famous for its tendency to block both the Central Asian trade route and the upper Shyok river and therefore the most accurately observed glacier, has experienced two principal advances within ninety years, one before 1842 and another from 1925 until to-day. Both long-lasting advances appear to correspond roughly with our Pangong rises. Visser[4] states that the glaciers of the Saser group had recently advanced, which would also correspond to the recent rise in lake-level.

It appears therefore as if definite relationships exist within this region between oscillations of precipitation, of lake-levels, and larger glacial movements. The geological significance of this lies in the fact that these slight oscillations of climate in Indian Tibet, occurring as they do in a much elevated region, seem to be of a similar, though much smaller, order to those which determined glacial and interglacial periods during the Ice Age.

[1] The authors considered that such changes of lake-level might be correlated to sunspot cycles such as the Brückner or Wolf cycle. In view of the uncompleted range of observations from this local area, it was thought advisable not to stress this point until a wider study of such phenomena can be made.

[2] "The Secular Variation of Rainfall," *Quart. Jour. of the Royal Meteor. Soc.*, vol. 45, 1919, p. 240.

[3] Kenneth L. Mason, "The Glaciers of the Karakoram and Neighbourhood," *Rec. Geol. Surv. India*, vol. 63, pt. 2, 1930, pp. 214–277.

[4] Ph. C. Visser, *Zeitschr. f. Gletscherkunde*, vol. 16, 1928.

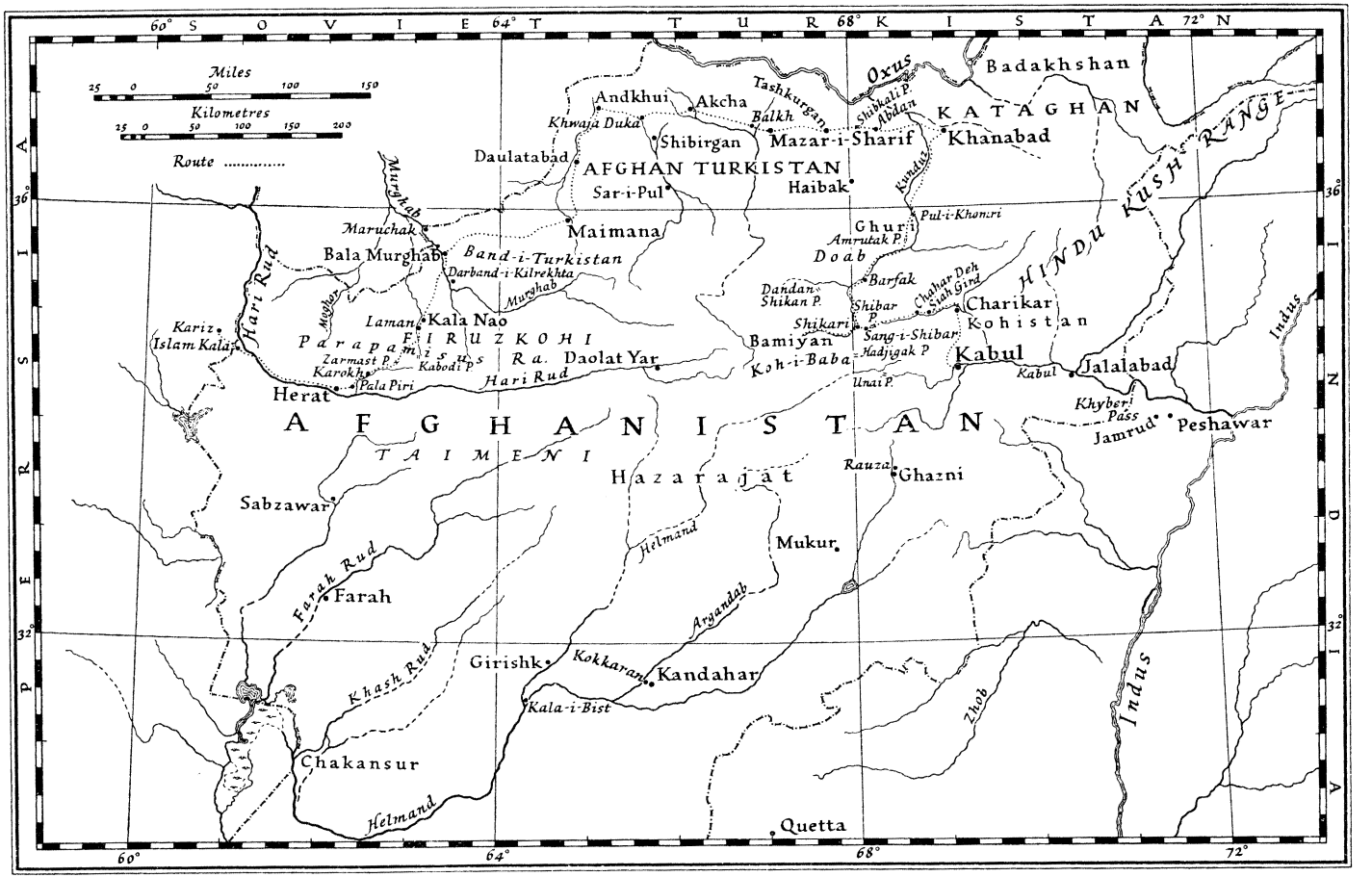
SOME NOTES ON A RECENT JOURNEY IN AFGHANISTAN

CHRISTOPHER SYKES

MY original objective was Luristan, which I hoped to visit in the autumn of last year. At no time is it easy to obtain the necessary permits from the Persian Government, who are anxious for the safety of foreigners and fear lest Luristan might give the visitor a too sensational impression of their country. But the time which I had chosen for making preliminary arrangements at Tehran was especially unfortunate. A very bad impression had been created in official circles in Tehran by the narrative which a foreign expedition published in a newspaper, particular exception being taken to the account of thrills and perils. The ultimate effect was an order from a high authority forbidding travellers to enter the Luristan and Bakhtiari provinces, and I was the first to feel the weight of this heavy penalty.

Other interests occupied me in Persia until the spring of this year, when the opportunity presented itself through the kindness of His Excellency the Ambassador of Afghanistan to Persia, Sher Ahmad Khan, to make a journey to Afghanistan and the less-known provinces of that country: Turkistan and Badakhshan. My friend Mr. Robert Byron had already attempted this journey in the winter. He is engaged on a work dealing with Islamic art in Persia and Afghanistan, and the object of his attempt was to visit Herat, Balkh, and Ghazni. He left Tehran at the beginning of November, crossed the Parapamisus, but was unable to go farther north than Kala Nao owing to heavy rains, and snow on the Turkistan pass. Nevertheless this short reconnaissance journey was, owing to his habit of acute observation, of great assistance to us on the second venture when, disappointed in my hopes of seeing the remote and great in Persia, I joined him. Much of the recording of the road was his work, of which I believe the public is to be offered a more detailed account in the form of a travel book from his pen. I offer these notes as likely to be of interest to readers of this *Journal*, not because of any valuable geographical observations made, but because these provinces are not often visited and as yet few travellers have done the journey by car, particularly by the Tashkurgan–Khanabad road.

We entered Afghanistan from Persia by the Kariz–Islam Kala road. The rains in Persia and Afghanistan this spring were abnormally heavy, and as the road connecting the two frontier stations passes through a tract of marshy country, a delay at Kariz of several days was necessary. There is however a southerly track hugging a low range of hills which is, although with difficulty, passable at any time of the year. By this we eventually crossed from one country to the other, passing through a village sometimes called Hajjiabad and sometimes Farmanabad. From Islam Kala to Herat the road is easy and well made, the 80 miles taking about four hours. The entrance to Herat from this side passes by the famous minarets (*haft minar*) and the Musalla. An interesting feature of this road is a village, about halfway between the frontier and the town, in which Turkomans have been settled, still retaining their distinctive dress.



Mr. Sykes' route in northern Afghanistan

Monsieur Hackin noted in his paper to the Society (*Geogr. J.*, vol. 83, p. 353) that owing to the improvement of communications Herat could no longer be considered an isolated town. To some extent this change has been accomplished already since the opening of the Herat–Maimana–Mazar-i-Sharif road, and is evident from the great variety of peoples in the bazaar and the goods for sale. The bazaars are now undergoing a vigorous course of renovation, and although sentimentalists will always bewail the destruction of the old, a tribute cannot reasonably be withheld from the excellence of the new designs. As is the case with most new building of this kind in the East, the old arched roof has been abandoned. Without the walls a new town is in process of erection, extending from the ark in the direction of the Northern hills.

Few things are so surprising to the traveller from the direction of Meshed to Herat as the tile work on the ruins of the Musalla and the minarets. Both the shrine of the Imam Reza and the Herat remains contain work of the time of Shah Rukh, and both are descendants of one tradition, yet there is very little resemblance in their style, design, or colour-treatment. The ribbed dome of the Musalla, similar to the Balkh dome, is the first indication of the Central Asiatic influence discernible in nearly all important architecture in this country.

From Herat we set out on the Northern road leading to Turkistan: thus traversing the same route which Monsieur Hackin discussed in his paper, but the other way round. From Herat the road follows the new Hazarajat–Kabul road until the village of Pala Piri (13 miles), when it leaves the excellent metalled surface of the new construction, turning to the north-east. Presently it enters the valley of an unnamed tributary of the Hari Rud in which by the village of Karokh (29 miles) is found the famous and delightful shrine. The garden of the shrine in which the Christian is hospitably invited to spend the night contains magnificent avenues of cypress and plane trees. It is distinguished amongst other things by two trees growing closely together, and to pass through the narrow interval between them is humorously supposed to be a sign of virtue.

From Karokh the road continues in the river valley for 39 miles. The valley is rich in pasture, and it is common to see, besides flocks and cattle, droves of mares. Near the head the road turns due north and rapidly ascends to the summit of the pass. This pass is generally identified with that which crosses the Zarmast Kotal. This identification probably arises from the lax application of names locally. For the pass most suitable for wheeled and animal traffic crosses a point indicated as the Kabodi Kotal on maps lent to me by the Survey of India, and this point is about 13 miles east and 4 miles north of that accepted by the surveyors as the Zarmast. This pass however is usually called the Sauzak, but sometimes the Zarmast. My personal opinion is that Zarmast is a general term applied to the whole of this section of the Parapamisus range. At all events it is very loosely used, but the point generally marked *Tang-i-Zarmast* or *Zarmast Kotal* on the maps is not the pass by which the negotiable road crosses. Disliking to confuse the issue further I hate to record that I have also heard the Band-i-Turkistan referred to as the Zarmast.

The crossing of the pass is dramatic. On the southern slopes the range is bare, supporting nothing more luxurious than camel thorn; on the north it is covered with a jungle of lofty juniper trees. The rainfall is considerably more

on this side, as the lush greenery, suddenly come upon, makes evident. This change of country reminds any one who knows the Firuzkuh pass of the descent from the Iran plateau into the Caspian provinces. The change here is not so absolute but more sudden

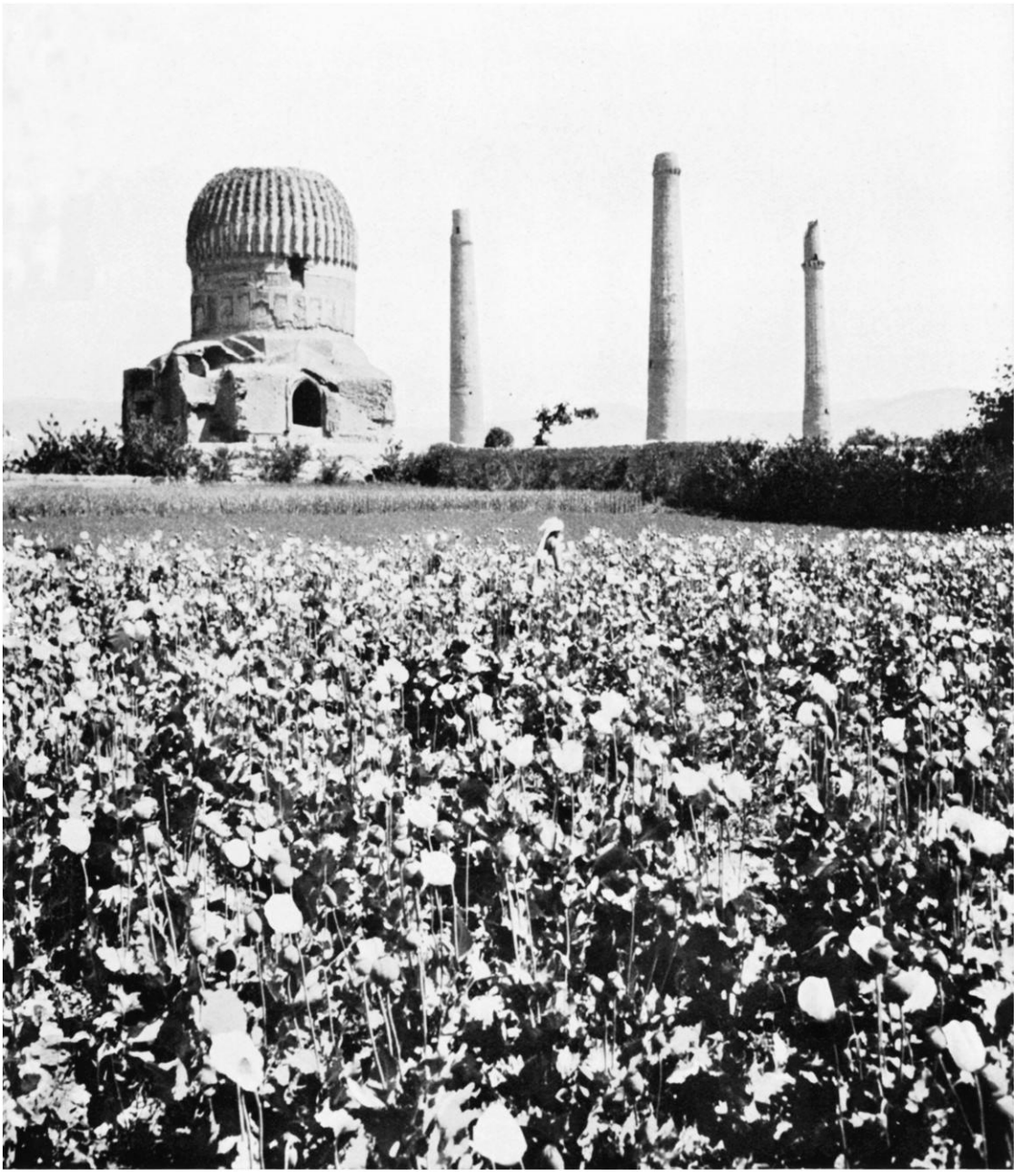
It is difficult, having only crossed in a season of abnormally heavy rainfall, to form any estimate of the road which now descends by a circuitous track from the plateau. It is certainly a piece of country in which the difficulties confronting an engineer are very great. The violent streams which a rainstorm bring raging down the precipitous gorges would cut up any but the finest structures. At the season in which we crossed it took us several hours to go not more than 15 miles. At the foot of the range is the village of Laman, a small dependency of Kala Nao, and I should like to take this opportunity to express my gratitude to the Governor of the latter place, who showed us friendliness and hospitality.

Having crossed the Band-i-Turkistan on horseback I cannot say how the motor road negotiates this range. The horse route, which takes the traveller through some of the most magnificent and loneliest country imaginable, pursues an independent course until it reaches the Murghab River, 20 miles from the town of Bala Murghab, at the bridge of Darband-i-Kilrekhta. Here the river flows through a narrow gorge fortified with towers popularly attributed to Alexander.

At Bala Murghab the change from the plateau to another country is first appreciated to the full. Although Afghans are still numerous the majority of the people are Turkomans and Usbegs. Here the predominating dress of the people is of the style associated with Turkistan: long flowered gowns, generally made of chintz imported from Russia, although the Bukharan stuffs are still quite common, and in place of the Afghan sandal, leather boots. The Usbegs and Tadjiks generally wear turbans with this dress, which is in general assumed also by the majority of Turkomans settled in the country; but in Bala Murghab, perhaps on account of its proximity to Russia whence there was reported to have been a recent flow of refugees, the Turkomans wear the large sheepswool busby. In Maimana, where according to the Governor's secretary many Turkomans are settled, the busby is never seen, and, on the same authority, the Turkomans sometimes wear the low cap bordered with fur, somewhat like the cap of Vladimir, also worn in some parts of Afghanistan by the Jews.

The country between Murghab and Maimana, a distance of about 110 miles, is uniform. The conformation is very singular: a kind of wold country consisting of small earth hills looking like a collection of barrows, and covered with rich pasture; wild barley and oats in abundance. As might be expected, the sheep and cows in this country produce very rich milk. The harvest richness of this corner of Turkistan immediately recalls the Transcaspian province of North-East Persia at Astarabad and Gumbad-i-Kabus—I suppose two of the richest natural corn soils in the world.

The road from Maimana to Andkhui continues through the same type of country, the hills growing less compact and the pasture more sparse. The village of Faizabad (25 miles), famed for its excellent water, marks the beginning of a less genial country, until, before Daulatabad, the country is bleak and dismal enough to call forth a period of "Arabia Deserta." Andkhui however



The five photographs are by Robert Byron

The Musalla at Herat: Mausoleum (c. 1430 A.D.) and three of the seven minarets

Putting out cured lambskins to dry on the roof of a caravanserai at Andkhui

derives its wealth from the harsh nature of the country where it is situated. The sheep pastures, productive of the *aarab* and the renowned *karakuli* skins, are such as to make the inexpert marvel that any beast could survive on so scanty nourishment. The closely curling wool of the *karakuli* seems to derive from a nourishment containing the very minimum of moisture, and one Usbeg shepherd with whom I spoke repeatedly pointed to the bareness of the downs, as if to furnish point to praise of his pasture. The flocks are owned for the most part by Usbegs or Turkomans who display a keen though not unfriendly rivalry. A short time ago most, or at any rate a large part, of the trade was in the hands of Jewish merchants, and this especially in Andkhui. The spirit of nationalism has of late affected commerce in this part of the world, and most of the Jewish merchants have been obliged to yield the trade to Afghans. Most of the Jews have, in consequence, left this part and migrated southwards to Herat. The most important skin markets are at Andkhui, Shibirgan, Akcha, and Mazar-i-Sharif, the most important being, on the authority of the merchants, Andkhui and Akcha.

A matter of astonishment to me was the high price of skins when, on the example of buying coal at the pit head, I wished to invest in this to us exotic and handsome article. The uniform demand both from those in the trade and not precluded the suspicion of a "try-on." The cost of a good lambskin was set at 80 Afghan rupees, of a faultless one at 100 Afghan rupees (approximately £2 10*s*.). Very few of the skins in the Andkhui market were under the former sum. When I urged the point that at such a rate every shepherd must be a millionaire, an Usbeg herdsman calmly replied that that was exactly the case.

While on this subject I should like to mention a theory for which I tried in vain while at Andkhui to discover support. Before starting on this journey I had been assured by a European agriculturist, living in South Persia, that the most important flocks had in former times been found near Bukhara; that the fame of these flocks was known to all herdsmen, and that the best flocks in all this corner of Turkistan were tupped by Bukharan rams. He had it further, on an authority which he respected, that most of these flocks had been destroyed during the Revolution, having been killed for meat, but that many of the rams, with sufficient ewes to continue the breed, had escaped the necessary massacre, and found shelter in Afghanistan. He had asked me to find what truth there was in this theory, but in interviews with herdsmen, merchants, and Government officials, I failed to discover evidence, and the name Bukhara when associated with sheep did not seem to stir any notable recognition. My own opinion and that of the Government officials whom I questioned is that the theory is fantastic, but I submit it to the Society on the chance that a reader may be able to supply the explanation.

From Andkhui to Balkh the road continues over the flat steppe land, sometimes desolate and sometimes green where the marsh land has been either drained for pasture or reclaimed and cultivated. At a small village named Khwaja Duka (81 miles) we saw a large drove of mares with a stallion grazing on what appeared to be a fine half-grass, half-corn pasture. Turkoman encampments are common until Akcha and easily recognized by the famous aspect of the *kebitka*. On several occasions we saw parties of Turkomans travelling, and the *kebitka* with its wooden doors, roof frame, and side posts,

together with the rush walls, is carried easily on two pack animals. The rapidity with which Turkomans can strike camp and start off is world-famous, and it does not seem beside the point to record here an observation made on the only occasion when I saw an exhibition of this feat.

The occasion was in 1931 at the Turkoman horse races in Persia when H.M. the Shah attended them at Bander Shah (formerly Bander Gez) on the Caspian. At the conclusion of the races, the Shah presented prizes to the winning jockeys. The assembled tribesmen numbered, at a rough computation, about two thousand. At the presentation every one was present. Then the Shah left. Five minutes after his departure all over the plain, even, it seemed, on the horizon, could be seen horsemen galloping away. All round the course there was a kind of storm of tents being taken down. Twenty minutes later only a few *kebitkas* were standing, and those were of the resident tribesmen, and in whatever direction one looked over the tremendous expanse of steppe one saw the same galloping figures, cartloads of tribesmen, and short rapidly moving caravans. By sunset, not more than a quarter of an hour later, there was no one to be seen except the few inhabitants of the immediate country.

In dry weather the journey from Andkhui to Mazar-i-Sharif can easily be done in one day. The distance is about 179 miles, and to Balkh 161 miles. Of the greatness of the sight when the latter city is first beheld with its long lines of destroyed ramparts it is difficult to convey an impression. Perhaps Marco Polo's terse reference best performs this office: "Balc is a noble city and a great, though it was much greater in former days. But the Tartars and other nations have greatly ravaged and destroyed it. There were formerly many fine palaces and buildings of marble, and the ruins of them still remain."

The mosque (the Masjid-i-Sabz) is now the only considerable building which decay has not left unrecognizable; of the Madrasseh the magnificent archway alone remains; at the western end of the town a battered ruin marks the site of the Masjid-i-Juma. The mosque has a ribbed or fluted dome similar to that of the Musalla at Herat, but the whole design of the building is of a different order, and to the uninitiated eye at least, suggests more powerfully than anything viewed hitherto the influence of Samarqand. Like so much Islamic building it suggests a devotion to façade at the expense of three dimensional proportions, but with an effect of clumsy concentration only relieved by a singular effect of the colour. Whereas in nearly all Persian tiled building the dominant blue is relieved of its steeliness by designs carried out on it in yellow, in this building the metallic quality of the blue is accentuated by whatever colour will raise it to silver; and as we saw it that evening standing out against a background of black thunder clouds, this effect was heightened to the strangest beauty. While at Balkh we met H.E. the Minister of the Interior, Muhammad Gul Khan, who was there supervising the laying out of plans for the reconstruction of main avenues. At the time of this visit the plans had not materialized in mortar and brick, but the Minister's work in Mazar-i-Sharif gives promise to the ancient city.

Balkh is separated from Mazar by 18 miles, and three roads, one direct, one *via* Baba Kohna and Deh Dadi, and one *via* Baba Kohna and Takhtapul, connect them. Mazar-i-Sharif has been greatly modernized of late: the western side is now taken up with the New Town. The most distinguished monument

is the shrine and tomb of Ali, a large blue-tiled mosque bearing three great domes surmounted by silver pinnacles. Although the mosque is a modern building the same treatment of the tiles extracting an effect of silver from the enhanced dominant blue suggests, however remotely, a connection with the Masjid-i-Sabz of Balkh. In all these towns in Turkistan it was impossible not to remark a certain *douceur de vie* most engaging. It is the custom in the evening for the inhabitants to repair to what we should term "the green," where bands, both brass and indigenous, discourse for several hours, and, at Maimana, the strength and youth of the town indulge in wrestling, gymnastics, and partridge fighting. In the latter sport, which is very popular, the cocks fight with natural weapons only.

For me one of the most interesting of surprises in Turkistan was to discover the great extent to which Persian is used as the language of everyday speech. This is all the more surprising to any one who has been in Persian Azerbaijan where, even in Tabriz, it is common to meet a man who only speaks Turki, and where half the people who speak Persian admix it strongly with Turki words and accents. Never in the bazaars of Mazar-i-Sharif did I find my own hideously ungrammatical rendering of Persian incomprehensible, nor did I ever find much difficulty in understanding. The Afghan pronunciation and use of words are full of divergence from classical standards, notably the use of *taklif* for "trouble" and such expressions as *ché gup* which would not be comprehensible in Persia, but it is interesting to note how much of the divergence is common to West Persian dialect: notably the pronunciation of *sh* as *s* and the degeneration of *f* into a vowel—Afghan often being pronounced *Awghan* and *ab* (water) becoming mysteriously familiar as *eau*. I was told that there is a movement at present to encourage the use of Pushtu in preference to Persian as the official language. One presumes that scholars would deplore this movement, and surely if the use of Persian as the universal tongue of the bazaars were to be dropped in this part of the world, there would be much cause for regret. I have it on the authority of the Vice-Consul of the U.S.S.R. in Mazar-i-Sharif that Persian is, though to a lesser extent perhaps, a common speech in the bazaars of Bukhara and even Samarqand. When it is considered that Baghdad and (presumably) Najaf and Karbala are virtually Persian-speaking towns, it is seen that a trader might pass thus from one extreme limit to the other of the Sassanid Empire and beyond, knowing only this one great language.

Those solemn clouds which had so enhanced the beauty of the Masjid-i-Sabz at Balkh were destined to play a considerable part in our future plans. A report soon found its way to Mazar-i-Sharif that the Wali of the province had been delayed at Haibak by a tremendous fall of rain involving landslides. The road, it was said, would be closed to motor traffic for some time. In the circumstances, disappointed in our hope of an excursion to the Oxus, we set about the task of hiring horses for the journey to Bamiyan and Kabul. Our arrangements were nearly completed when a lorry owner, Sayyid Jamal by name, an inhabitant of Khyber, brought the news that the journey south might be done by car: not by the Haibak road but by Kunduz and Khanabad. The opportunity, as it thus presented itself, of going farther east and seeing the province of Kataghan and possibly of Badakhshan was too good to be missed,

and it involved a remote chance of entering the Wakhan. A little regretfully we countermanded the horses and made a contract with Sayyid Jamal. Should any reader of this *Journal* ever find himself in Kabul anxious to do a journey, let me here recommend Sayyid Jamal as the most courageous driver and excellent companion whom it has been my fortune to travel with.

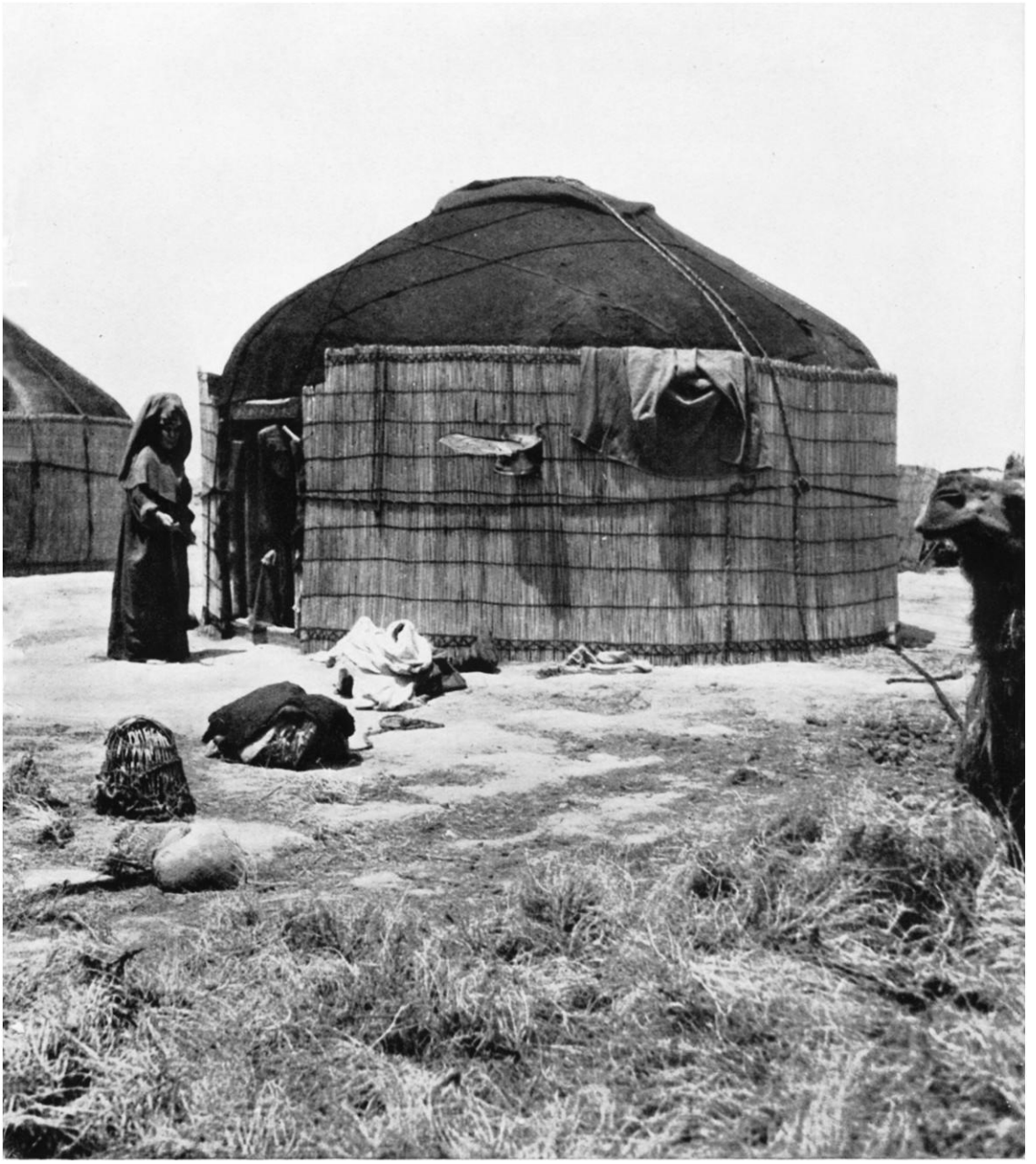
The road from Mazar-i-Sharif to Kunduz presents no difficulty, a great part of it being metalled. Between the town and Tashkurgan we encountered no object of especial interest except a lizard of size so vast (3 feet) as almost to make him a dragon. The town of Tashkurgan is 35 miles from Mazar-i-Sharif. According to the distances recorded on the reliable speedometer of the machine, the village of Abdan and the Shibkali Kotal should be placed about 5 miles west of the position they occupy on the maps lent to me. Fifty-five miles from Mazar-i-Sharif the road approaches the Shadian foothills, after which it enters a great plain before ascending the Band-i-Kataghan, which is first encountered at its foothills at the 84th mile. The pass which, from the Turkistan side, is no very grave matter, is 4 miles long. From the top a wonderful view comes into sight of the Kunduz plain, the dark green lines of the river marked heavily in the tawny colour of the plain, and beyond it the white heights of the Hindu Kush. The descent into Kataghan, a considerable drop, continues until a tributary of the Kunduz is reached 7 miles distant from the summit of the pass. Four miles farther on it meets the Kunduz river.

Up till the present no bridge has been built over the river, but a ferry meets the demands of lorry traffic, while horses are swum across with an expert swimmer to guide them. The rapidity of the stream is very great, and the embarking stage is about 100 yards upstream of the landing-stage although the breadth of the river is not more than fifty. Once the car or wagon is on board the ferry is left to the mercy of the river, which immediately carries it to mid-stream. Here the pilots dive into the water, and swimming with three limbs and holding a guiding rope with one hand, they bring it to harbour. The whole operation takes little time. Two miles from the river is the town of Kunduz. From here to Khanabad the road is difficult to follow. It passes through two river-beds, at the second of which it meets the Khanabad–Kabul road, having made a wide detour necessitated by the marshy lands west of the town.

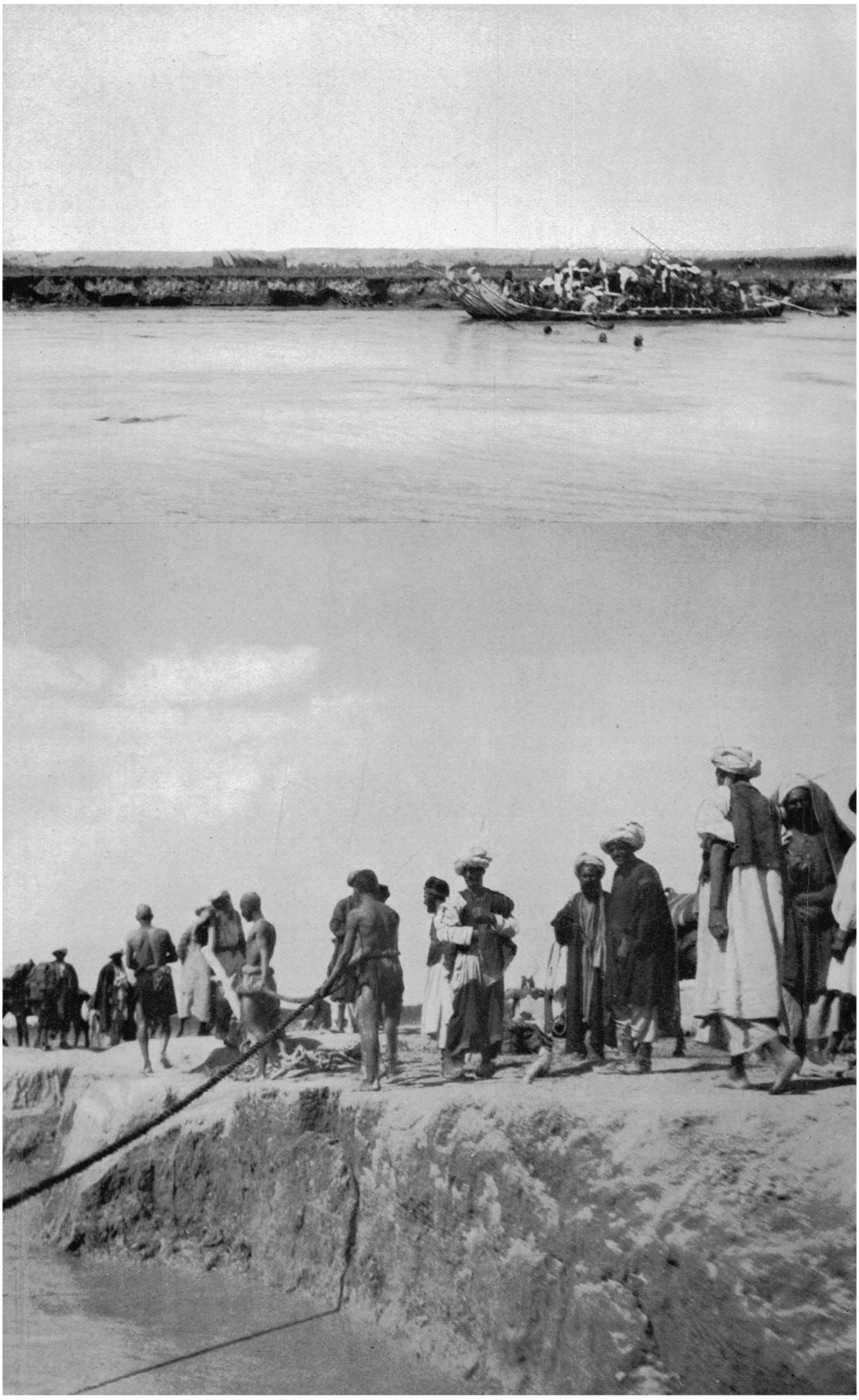
Khanabad, like Kunduz, was formerly situated in a dismal tract of swamp land. An efficient system of drainage has now rendered the place healthy, as it has transformed Kunduz from an almost uninhabitable collection of hovels[1] to a productive agricultural locality. We were lodged in a delightful encampment which the hospitable Governor arranged for us in a tree garden. The trees were of the *chenar* order of plane, reminiscent of the gardens of Persia, but excelling all but the most sacred of plantations in soaring and magnificent stature. The surrounding fields grow corn and rice, and in scattered situations groups of a kind of asphodel. The latter, curiously enough, is not grown for ornament but for an excellent bread made from the crushed seeds.

The first 18 miles of the road south to Kabul is complicated by unbridged watercourses. These present no too serious impediment as they are seasonal only, and, though we travelled along this road at the most difficult time of year, we were able to outstrip the fastest horse with ease. The gravest obstacle was

[1] It is supposed that Moorcroft and Trebeck died of a fever contracted in the malarial swamps of Kunduz.



Kebitka tent at a Turkoman encampment between Andkhui and Akcha



a muddy flow, which we encountered 37 miles south of Khanabad. A storm somewhere to the south-east had been responsible, and the mysteriously rising and lowering water was never under the belly of a horse. After spending the night by the stream, in the hopes of it having subsided in the morning, we were appalled to find, in spite of a cloudless sky, that it had actually risen. The solution of the problem was simple. Although the road embankment through the stream had been washed away, the drivers of the collected lorries decided to plunge their machines in the water, drive down it about 60 feet, and turn up on to the opposite bank at a point where it rose more gently, though horribly steep enough. The manoeuvre was carried out with great dash and success. I mention this matter as illustrating the resourceful courage of drivers in this part of the country, a sovereign asset where the natural difficulties to road making might be so discouraging. Ten miles farther on the road meets the main village of the group named after the Baglan department. At the 53rd mile the road rejoins the valley of the Kunduz river, which it had previously followed for a mile, before leaving the Khanabad plain for some foothills 35 miles before. The river is followed until the road makes a short diversion of 5 miles to the east, crosses the magnificent old Pul-i-Khomri, and then returns west and south, meeting the main Mazar–Tashkurgan–Haibak road 8 miles beyond the bridge.

Three miles beyond the junction the ascent from the Ghuri plain to the Kampirak Pass begins. After winding about the foothills the road makes the latter part of the ascent on a fairly straight track which runs along a series of natural bridges or saddles. The pistachio line is passed 4 miles from the beginning of the ascent, and the summit is reached after 8 miles. At the time of the year (early June) when we crossed this pass, which might be taken as the bridge between the Iranian or Middle East and Central Asia, it may be soberly described as the most astounding landscape imaginable. The harsh crags over the snow-line, with their implication of the grimness of the plateau, dominate a scene of vast undulations covered with green grass and flowers, and distantly, lines of tree and field indicate the course of the Kunduz in the plain. On a clear day it must be possible to see almost as far as the Oxus, though the traveller would easily believe that he can see Samarqand itself in the vast scene.

On the northern side of the range the road descends moderately for 8 miles, when it enters a narrow and difficult defile, which I presume to be at the place marked "Amrutak Kotal," where it descends for 5 miles before meeting the Kunduz again. The river, which is now flowing due eastward, has changed its name to the Ghuri Rud. The road enters a valley between vast rock mountains, following the river upstream. The river is rejoined at the 100th mile, and the first considerable village is met at the 112th mile: Tala Barfak. In the spring this village is strangely desolate. It is the winter and summer habitation of herdsmen, but at the time of the spring grass and crops (the *bahari*) it is deserted except for a few ancients and a hospitable dispenser of tea.

Nineteen miles farther on the remains of the Sassanid foundation, the Castle of Barfak, stand on an eminence in the midst of a widening of the valley, and 6 miles beyond the road follows the river up into a series of gorges, which continue for a distance of approximately 48 miles. The most notable interruption in the series is the plain of Doab (149 miles from Khanabad).

The Kunduz ferry: (above) guided across the river by swimmers, (below) awaited by a crowd on the east bank

After the Kampirak pass, the long gowns of the Turkish fashion become rarer, until by Doab the people wear, almost to the exclusion of other dress, the loose draperies of Afghanistan proper. Two things are notable in this village—British petrol and glasses for tea in place of bowls. The latter is an interesting point. On the western side (that is, approaching Turkistan from Herat) the "region of the bowl" appears to begin at Kala Nao. In spite of the proximity of Russia, the bowl is preferred to the glass throughout Turkistan and Kataghan, and on this road is not ousted by glass until Doab. There probably is a faint hint of China, rather than a Persian survival, the venerable bowl having been discarded in Persia and the more Iranian part of Afghanistan. It would be interesting to know to what circumstance this marked preference is due.

From Shikari (179 miles from Khanabad) we turned off, on the new road, to Bamiyan. On rejoining the Mazar–Kabul road a day or two later, we followed the series of gorges for a few more miles until we left it for the ascent of the Shibar Pass, spending the night at an upland village (Sang-i-Shibar) where our escort entertained us to a concert of guitar and song. The elder of them declared the opinion that in India, Afghanistan, Persia, and England the music was of a high order—in other places it was bad. "But Russian singing," I urged. "Oh, it's rotten," he replied (*Bessya kharab! Bessya kharab!*).

The Shibar Pass, which marks the Oxus and Indus watershed, is reached by an easy ascent 4 miles beyond this village. Two miles farther on we were again delayed by the effects of the abnormal rains this year. For 17 miles the road was frequently blocked by mud slides, which the precipitous nature of the cliffs either side of the valley render a constant danger in the spring months. The road itself is admirably designed and has a very good metal surface. Such things as these constant mudslides provide typical illustration of the difficulties in face of which such excellent work in communications has been carried through by the Kabul Government. The bazaars of the villages, Chahar Deh (226 miles), Siah Gird (233 miles), and Charikar become rapidly larger and more cosmopolitan in their wares as the road nears the capital. The plain of Charikar is entered by an iron bridge, and as the traveller leaves the main Hindu Kush ranges and enters the Koh-i-Daman regions, he finds himself in the normal plateau landscape, which is here curiously reminiscent of the Zand valley between Isfahan and the Bakhtiari mountains.

We reached Kabul at the 297th mile. We had covered 930 miles from Herat, travelling in no hurry; and under perfect conditions this journey could probably be done in eight days. For the first part of the journey we were in a Chevrolet four-seater ("machine-i-sawari" is the newly coined word for such a vehicle) which broke down completely at a caravanserai named after the Moghor district·50 miles before Murghab. The fault of this car when used on these roads was a too low clearance. From Murghab to Maimana we travelled in a Ford car. The rest of the journey was done in Chevrolet lorries, which seem the ideal cars for this country, the clearance being sufficient, and the engines giving no trouble. In all we covered 1360 miles in Afghanistan, under unusually difficult conditions, and without any really grievous excess of trouble. Of this distance only 50 miles were covered by horse, which 50 miles, with all respect to progress, were very much the most delightful.

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THE HIMALAYA EAST OF THE TSANGPO: *A paper read at the Evening Meeting of the Society on 30 April 1934, by*

F. KINGDON WARD

IN 1933 the Tibetan Government gave me permission to botanize in Zayul. This permit was obtained through the kind offices of the Keeper of Botany, Natural History Museum, the India Office, and the Government of India. Nothing was known of the flora east of the Tsangpo gorge, and I therefore decided to reach that area by the most direct route, namely, *via* Assam, the Lohit valley, and Rima. I was fortunate enough to find a willing assistant in Mr. Ronald Kaulback, who undertook to make a route survey, and do any other work assigned to him; but the Tibetan Government was unable to allow him to proceed beyond Zayul. Mr. Brooks-Carrington, of Raycol British Corporation, also accompanied us at the outset to make a colour film.

It is unnecessary for me to dwell on the country between Sadiya and Rima, as this has been described before by Colonel F. M. Bailey (*Geogr. J.*, April 1912) and by myself (*Geogr. J.*, May 1930); more recently in a lecture given before this Society by Mr. Ronald Kaulback (*Geogr. J.*, March 1934[1]). I might however add a few words on the flora. As far as Minzong the valley is filled with Indo-Malayan jungle, although *Pinus Khasia*, Albizzia, Oak, and Ash have already heralded a change. The mountains on both sides of the gorge however are very high, and temperate forest and even conifer forest is quickly reached in that direction, with the Lohit still in sight. March however is rather a dead season, and there were few trees in flower. An interesting little ground Orchid (*Odontochilus*) is common almost up to the Tibetan frontier, and below Minzong I found a handsome orange-flowered ground Orchid new to me which might belong to the same genus. Another plant worth mentioning —almost a weed of cultivation right up to Rima—is a species of Geranium with lurid crimson flowers.

Above Minzong the climate, and hence the vegetation, begins to change rapidly, until by the time Rima is reached the Indo-Malayan jungle at the bottom of the valley has been entirely replaced by Pine forest, with temperate forest at higher elevations. *Pinus Khasia* is now the only big tree, though thickets of small trees, both evergreens and deciduous, occur immediately

[1] The map facing p. 183 should be used for parts of the present paper.

along the river bank, or lining the streams. But the woody vegetation is now mainly scrub. Meanwhile the mica schists, pyroxene granulites, and diorites of the lower valley have been replaced by granite.

As far as Minzong at any rate there is no evidence of glaciation in the Lohit valley; if it ever existed the abundant rainfall has removed all traces. At Minzong the Ghalum river comes in from the east, in line with the westward direction of the main river; so that looking eastwards from below the confluence, the large valley of the Ghalum appears to be the continuation of the Lohit valley. We spent a day at Minzong in order to examine the confluence. The mouth of the Ghalum valley is about 400 yards wide, and a high gravel bank, covered with vegetation, faces the Lohit; but the Ghalum itself is only a large torrent, at this season 20–30 feet wide, flowing under the northern wall of its valley. It is smaller than the Delei river, and how Mr. D'Arcy Weatherbe could compare it with the Lohit, even in May, I do not understand (*Geogr. J.*, July 1926).

Above Minzong the Lohit, now flowing from the north, is confined to a narrow gorge; the gradient increases, and there are big rapids, the most formidable being near the village of Sati, where there is a fall. The first unmistakable sign of glacier action is seen at Walong, on the Zayul frontier. Here a large terminal moraine fills the valley; the river has cut through it. The outline of the valley now changes: the overlapping convex spurs disappear, and the V-shaped section is replaced by a more open U-shape, concave towards the base. Combined with an entirely different and scantier vegetation, this completely alters the appearance of the country. Straight-sided narrow gravel terraces, covered with Pine forest, replace the cultivated terraces seen below. During or after the disappearance of the ice, the valley seems to have been filled with gravel, to a depth of several hundred feet, which suggests either an arid period following the de-glaciation, or an interglacial period. Subsequently the river cut through the gravel floor, stranding terraces one above the other in series. Some of the high terraces above Rima were formerly cultivated, but are now derelict owing to the impossibility of irrigating them.

We reached Rima on April 1. Several Europeans, including the late Mr. Dundas, and Mr. T. P. M. O'Callaghan, Inspector-General of Police, Assam, visited Rima before the war. In 1872 Mr. T. T. Cooper attempted to get there from Sadiya, and reached the Ghalum river; previous to this, the French Catholic priests, Pères Crick and Bourie, had been murdered a little south of Rima. In 1911, Captain (now Lieut.-Colonel) F. M. Bailey had crossed from Batang to Sadiya *via* Rima. Hitherto no white man had been up the western branch of the Lohit; but the Pandit A. K.[1] had travelled by this route to Lhasa, and had written a report on the country, the accuracy of which is remarkable; not less remarkable is the fact that in fifty years there has been no appreciable change in the valley. Hitherto the east branch of the Lohit has always been regarded as the larger, under the name Zayul chu; the west branch, or Rong Thod chu,[2] as the tributary. The Tibetans regard them as equal, though personally I am inclined to think that the western branch

[1] "Krishna" or Rai Bahadur Kishen Singh. Died 1921.

[2] So written on the maps. Actually Rong Tö chu (རོང་སྟོད་ཆུ་).

discharges more water, at least during the summer, if it is not actually the longer. Both rivers rise in glaciers, and the Rong Tö chu certainly receives more glacier water than the other. Below the confluence, the Lohit is called the Rong Mè, or lower river. Zayul, by the way, is conventional for Tsa yul ="the hot country," or possibly "the grass country"=by extension "the green (forested) country."[1]

The vegetation of the Rong Tö valley is very similar to that of north-western Yunnan at the same altitude (5000–9000 feet), but there is also a strong Himalayan element. Interesting trees found here are *Schefflera shweliensis*, Cedrela, Carpinus, Ailanthus, Symplocos, *Acer pentapomicum* and *A. Campbellii*, Ilex spp., Quercus spp. *Michelia lanuginosa*, *Abies Pindrow*, and *Tsuga yunnanensis*. Rhododendrons include *R. virgatum*, *R. bullatum*, *R. arboreum*, *R. sinogrande*, *R. auruem*, and *R. megacalyx*. Amongst herbaceous plants, *Iris kumaonesis*, *Caulphyllum robustum*, *Lilium Wardii*, *Stellera Chamaejasme*, and Cypripedium sp. may be mentioned. There are very many shrubs, including the Himalayan *Vaccinium glauco-album*, a Chinese Jasmine, Pyracantha, and two species of Coriaria. The important point however is that the Rong Tö valley, and to a lesser extent that of the eastern branch also, is well wooded.

Eastwards and northwards the climate gradually gets drier, with an increasing period of drought in winter. Thus the west range of mountains, forming the Mishmi Hills frontier, is much more dissected than the eastern flank. There are more and bigger streams, and they have thrown out bigger alluvial cones, consequently the population is mainly confined to the right bank of the Rong Tö chu, and there are few crossing places. Although I did not explore the Rong Tö beyond the Ata chu confluence till November, it will be convenient to continue straight up the valley now and consider my further explorations beyond the Ata Kang Pass later. I had already observed a great snowy range trending north-west or west-north-west, and my object in following the Rong Tö was to keep along the base of this range and trace it as far as possible. Above the confluence of the Ata chu, I crossed the first big tributary from the north, clearly a glacier stream, thereafter reaching the last village, called Putsang. The present inhabitants of Putsang came from Chinese Tibet about twenty-five years ago. Long before that there had been a village here, but the inhabitants had migrated over the Kangri Karpo La into Pemako. A mile above the village is a beautiful monastery, built of timber, on a stone and mud foundation. It was built by lamas from Drowa, and is called Drowa Gompa; but owing to lack of funds it is still unfinished. There is no image of Buddha inside it, and the painting is not done. The village itself comprises sixteen or twenty timber houses, in a bay of the mountains. The people live as much by hunting as by agriculture, and trade with Sadiya in skins and musk. They pay no taxes. I found one man who spoke Chinese.

The headman said it would not now be possible to cross the Kangri Karpo La, but he promised me coolies to go several days' journey up the valley, and we organized a hunting expedition. It is at least 15 coolie marches to Shingki

[1] I have not the Tibetan spelling by me. The sound "tsa" might mean either "hot" or "grass," according to the spelling. Another example of a similar extension common in Tibetan is Tsa Ri=literally the "grass" mountain, and by extension, the "wooded mountain."

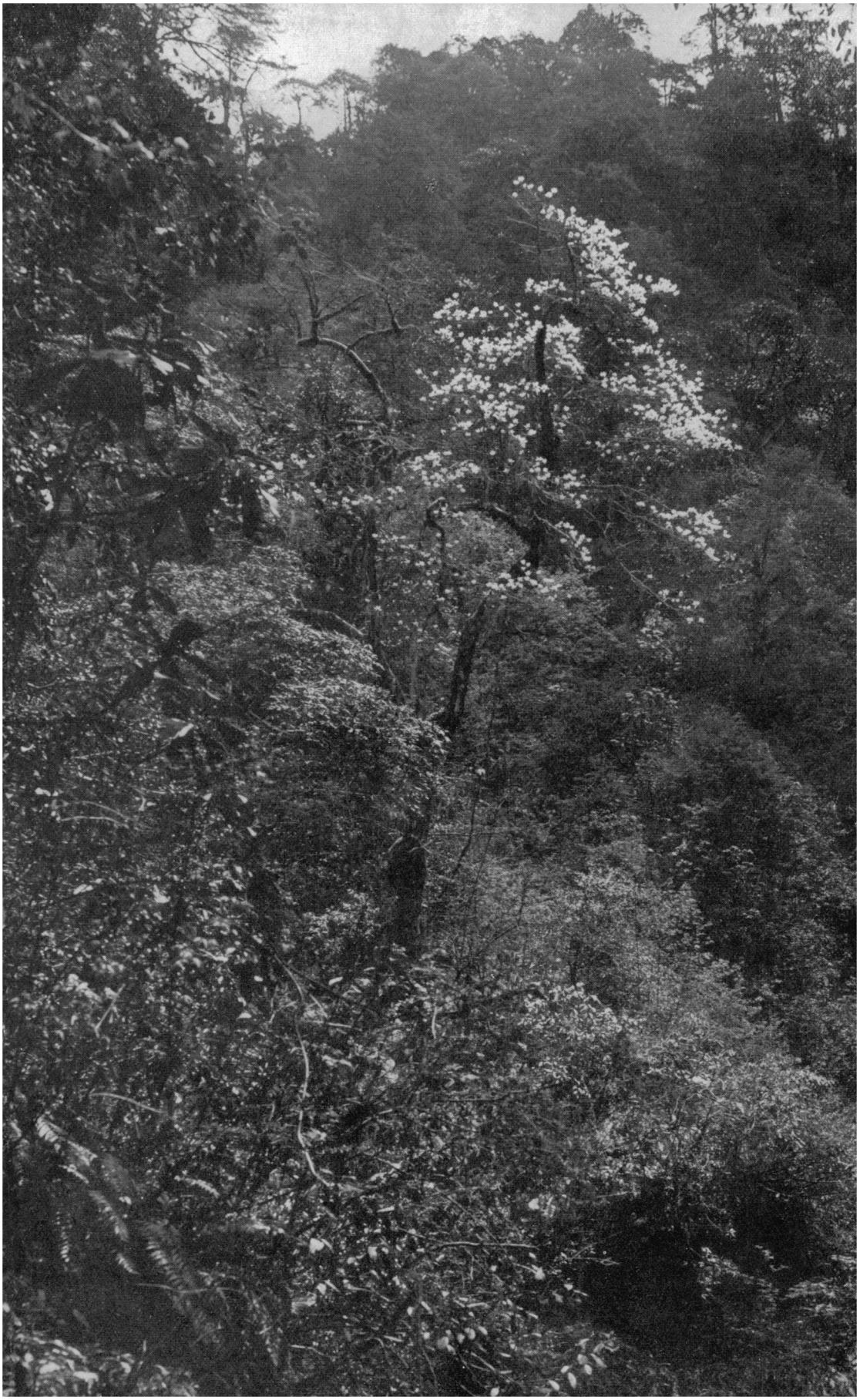
Gompa, on the Chimdru chu, in Pemako; the pass is higher and even more difficult than the Ata Kang La. No traders pass this way, but a few pilgrims cross each year. Maps show the Kangri Karpo La at the head of the Dri river, which is the ultimate source of the Dibang; but this is incorrect. There is no route between the Dibang and the Rong Tö (here called the Zayul Ngu chu) north of Putsang. Bebejiya Mishmis do not come into the valley of the Zayul Ngu chu.

We left Putsang on November 1 and, marching only a short distance, camped in the forest. From this point onwards the gorge was thickly forested. For the next four days we climbed steeply, the river gradient increasing steadily. The Dibang divide rose precipitously in tremendous granite cliffs. From a point a few hundred feet above the river I could see the tops of a group of 19,000-feet peaks near the source of the Dri, which will give some idea how vertical the mountains are. The depth of the gorge is terrific. Not a single stream of any size joins the Zayul Ngu chu from the Mishmi divide, and every stream cascades into the main valley. The large tributary shown on the maps of the Survey of India, in lat. 29° N. long. 96° 15′ E., entering the Zayul Ngu chu from the south-west, does not exist. There is no room for it. Practically all the water of the main river is derived from the snow-range to the north. Between the Ata chu and our last camp we crossed five big tributaries coming down from the snowy range; several times I caught sight of glaciers to the north or north-east. We passed through much Rhododendron forest, and could mark the ascent, and also the approach to a drier climate, by the change of species. Where the ground was damper, dense thickets of Bamboo flourished. There were many evergreen as well as deciduous broad-leafed trees.

On November 3 we camped under a cliff, on a platform which overhung the Hrikung chu. This stream had cut a wonderful gorge through the wall of the main valley. We had now ascended 1600 feet in three days. The forests contain takin, gooral, serow, and musk deer, and I noticed that there were hunters' paths up all the big torrents. Three of our party now left us, and crossing the main river by rope bridge, climbed up towards the Dri river divide. We continued up the main valley. At last, on November 5, the headman said his coolies could go no farther, and that it would be impossible to reach the pass. There was no snow here, the weather was fine, but a storm might blow up from the south-west any day. The river divided into two equal streams, and we camped in a belt of forest at the confluence. We could not see far up either valley, but the cliffs above us looked quite bare.

Up to this point the path, though not good, had been easy to follow; now it became more difficult. I followed the stream from the north (Dali chu) the next day, and half a mile above the confluence came upon a remarkable gorge, about 100 feet deep and so narrow that one could almost stride across it; the stream plunged headlong into it from a wide open valley, almost bare of trees, at an altitude of about 10,000 feet. Gaining the open valley above we were able to wade knee-deep across the broad stream. Some distance ahead I could see bare peaks and patches of snow and Fir forest. There is said to be a path into Pome, and down to the Nagong chu, and indeed there was nothing to hinder us going on for some distance at any rate; but it can only be a hunter's

Magnolia Campbelli, 60 feet high, in the Mishmi Hills



trail. The track to the Kangri Karpo La crosses the deep gorge just referred to, and continues up the left bank of the north-west branch (Keli chu). The mountains are composed entirely of granite, which would partly account for their bareness; I could see no permanent snow in any direction, but the sides of the gorge are too precipitous to permit of an extensive view. It seems certain that a glacier descends from the Kangri Karpo La. On November 7 we started back, but hearing that the hunters had shot three takin, we camped early. Next day a working party went up the mountain to bring down the carcases: the animals were skinned that night, and the meat smoked. We covered the remaining four marches to Putsang in three days. The fine weather had broken up, and the trees were powdered with snow down to 9000 feet; a party of hunters on their way up the valley turned back. From Putsang I marched straight back to Solé, on the Rong Tö chu, where I arrived on November 15.

My next object was to find a pass leading from the Rong Tö valley into the Dibang valley. There was said to be one just north of Solé, where a large stream enters from the west. Some Bebejiya Mishmis, whom we had seen at Solé in May, claimed to have come by this route, which leads to the Tangon river. The Solé people however do not hunt, and I could find no coolies there who knew the route, or were willing to accompany me.

Another route leads to a pass above Mugu, a few miles south of Solé, and this pass, called the Jara La, was well known to the hunters of Mugu, who agreed to take me there. Formerly the pass was used; but owing to friction between the Tibetans and Bebejiya Mishmis over hunting rights, the lamas have closed it. The path—a good one—ascends very steeply through a deep gorge, densely forested, to a high-level hanging valley, which has been graved by ice. During the summer this upper valley is a marsh, and even in November parts of it were boggy; there are several small tarns. Rhododendrons in great variety grow here, also *Meconopsis betonicifolia* ("*M. Baileyi*").

On the third day we camped in alpine meadow at a height of about 12,000 feet. For the last 2 miles the valley was level; then came a "riser" of large boulders, and above that another wide level marsh. Beyond that again the valley narrowed rapidly to the foot of a small glacier. There was no exit in this direction. The mountains flanking the valley rise steeply for several thousand feet, and snow beds, all that remains of the glaciers, were visible here and there. Immediately above our camp, to the west, was a hanging valley, from which a stream, encased in ice, cascaded down the cliff. The cliff however was covered with Fir forest, and snow lay under the trees. A steep path zigzagged up, 1500 feet to the lip of the valley, just over which lay a beautiful glacier lake, surrounded by steep stony slopes covered with snow. Skirting the lake, scrambling over boulders, and trudging up a long steep snow slope, we reached the Jara La four hours after leaving camp—but this included halts to collect seeds of many alpine plants I observed. The day was gloriously fine, and we had a wonderful view into Assam, though it would hardly sort with one's preconceived ideas of that country! Immediately below us a small stream flowed through an alpine valley, clothed with turf and scattered bushes: it was the source of the Tangon river. A short distance to the south the Silver Fir forest began. There was no snow at the bottom, but

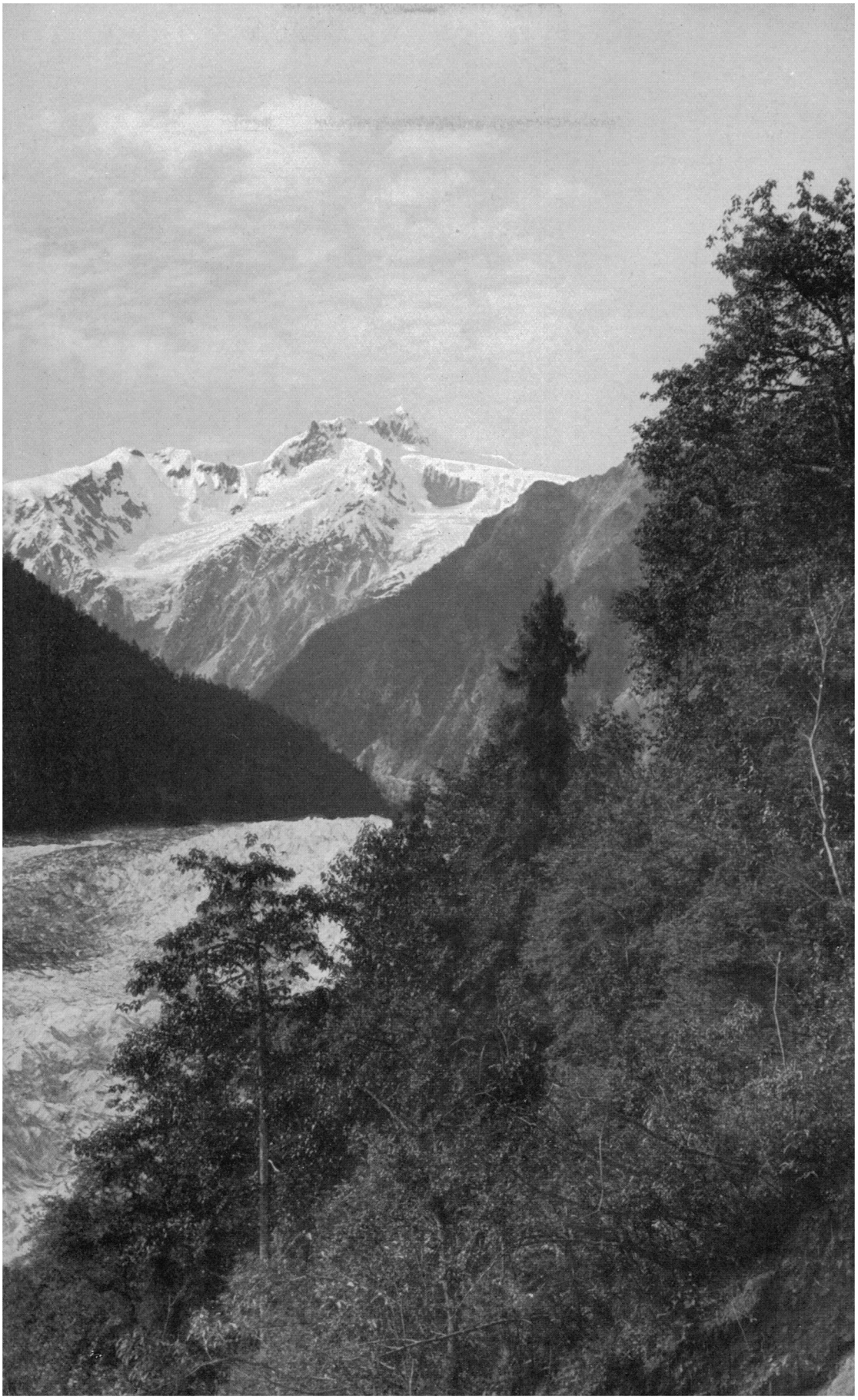
Bamboo bridge over the Ata River

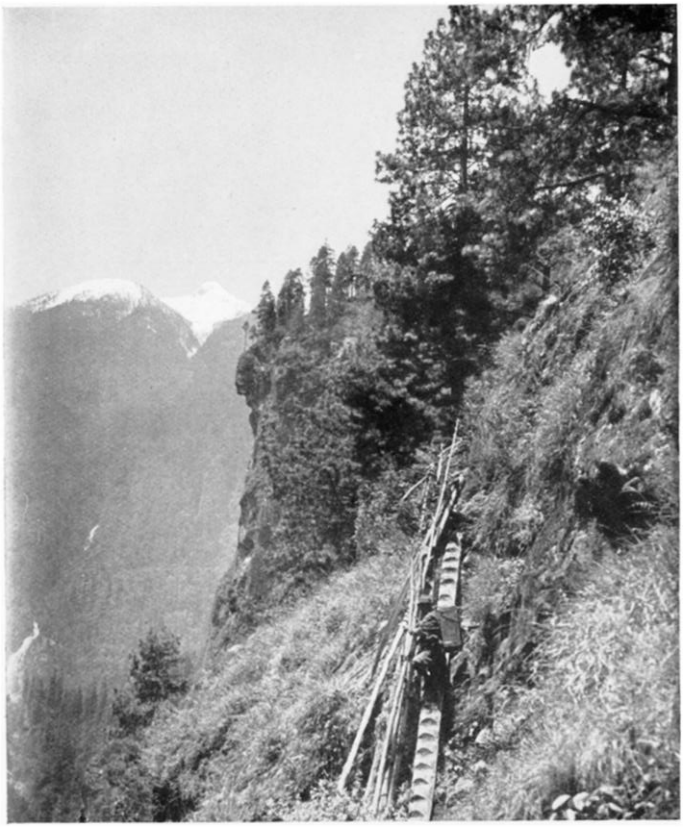
ridge beyond ridge rose in the west, all snow covered. We were looking across a great grid of mountains from amongst which rise the sources of the Dibang; these valleys also had been filled with glaciers. The Jara La is about 14,000 feet high, and is surrounded by rocky peaks of 16,000–17,000 feet.

It was easy now to appreciate how completely the Rong Tö valley and all western Zayul is cut off from Tibet proper, and from India as well as from China. Ever since the disappearance of the glaciers, and the deepening of the valleys by water, they have been separated by lofty barriers. For the greater part of the year the passes are closed; implacable jungle completes their isolation. It may be that during an interglacial period all this country which lies to the south-west of the Salween divide was inhabited by a fairly homogeneous race, driven steadily southwards during a previous advance of the ice. Conditions then may have been more uniform: the valleys were broader and higher; there may even have been more arable land. But since the deepening of the valleys and the cutting away of the great gravel beds which accumulated, isolation and differentiation became inevitable. Where people can only communicate with each other with difficulty and at certain seasons of the year, one society stabilizes into the visited, the other develops into the visitors. The aboriginal pygmy race of the Rong Tö probably sprang from the same stock as the Bebejiya of the Dibang valley and the Daru of the Irrawaddy; but they have now segregated into three distinct tribes, speaking different languages, and with different customs. Fundamentally no doubt the resemblances are greater than the differences; but the only obvious resemblance is that they are all pygmies, averaging perhaps 58 inches in height, with remarkably round faces.

Meanwhile, Zayul being more accessible from the Tibetan plateau than it is from Assam or Burma, the Tibetans have to some extent absorbed the Zayul aborigines, and developed their own civilization in the Rong Tö valley. Their outposts are to be found still farther south, in Assam and Burma, but it is improbable that they will advance beyond the limit of Pine trees, which are to them what bamboos are to the real jungle dwellers. With a higher civilization developing in Zayul, the tribes outside have become the visitors. Every autumn, Darus from the sources of the Irrawaddy, Bebjiyas and Chulikatas from the Dibang, Mijus and Taroans from the Lohit, come into Zayul to work, or to buy salt and cloth; all these tribes are included in the comprehensive term "Lhopa" by the Tibetans. Similarly, Abors visit the Tibetan villages on the Tsangpo above the great gorge. Thus there comes about an inevitable backwards and forwards surge of the tribes trapped in the hills between the plateau and the plains; those living just under the plateau ascending annually to the plateau, and those on the fringe of the plains descending to the plains, the two parties mingling at other seasons. Zayul, with a climate intermediate between the hills and the plateau, cleaves definitely to the latter. It is permissible to speculate whether, during an interglacial period, when the Rong Tö valley stood at a higher level, it supported a larger population; but there is no evidence that it did. The aboriginal population may even have been smaller than it is to-day, if it lived mainly by hunting. From the report written by A. K. we may conclude that the population has hardly changed in the last fifty years; and so terrifically steep are the mountains, it is certain that the valley could not support a much larger population than it does now.

The great Ata Glacier and a peak of the snow range above the Ata Kang La





Ladders in the Ata River gorge

Hut-building in the Delei valley of the Mishmi Hills

The population is mainly agricultural, but partly pastoral. In a few villages hunting plays an important part in the lives of the people. Above Rongyul, yak are kept. But the greater part of Zayul is uninhabited and uninhabitable; the same is even more true of the Dibang basin, and of the region at the headwaters of the Irrawaddy. The total superficial area of this hilly country, lying within the triangle Sadiya–Fort Hertz–Shugden Gompa, is about 25,000 square miles—actually it must be vastly greater; the total population is certainly less than one person per square mile. After climbing to the Jara La, I explored the head of the valley, and on November 29 reached the Rong Tö again. I noticed that the glaciated upper portion of this, as of other valleys on the Mishmi range, trended more or less north and south; it is the glacier torrents which swing round to the east, to reach the main river. That is to say, the main glaciers lay in longitudinal valleys; the torrents have cut transverse valleys.

I will now return to our journey up the Ata chu from its confluence with the Rong Tö. On May 25 we reached the confluence. This Ata chu emerges through a remarkable gorge, descending from the glaciated upper valley at Modung down a very steep gradient. It was originally a hanging valley, but the active glacier river has cut out a channel for itself so rapidly that it now reaches the Rong Tö chu without any vertical drop. The side streams however still fall over cliffs into the Ata chu, just as the smaller tributaries cascade into the Rong Tö chu. When the Ata glacier reached Modung, a few miles below its present snout, at no very remote date, the gorge did not exist, and the Ata chu must have fallen over a cliff 1000 feet high. There was no glacier in the Rong Tö valley then, and the river from the Kangri Karpo La was steadily deepening its valley. The passage of the gorge is not easy, as the river, 40 yards wide, fills it from wall to wall. After scrambling along the water's edge for half a mile, one ascends the cliff by a series of rough ladders, and gains the upper valley by a high-level path, consisting partly of wooden galleries clamped to the cliff, partly of rock ledges, and partly of mud. The gorge of the Ata chu is cut through granite, but above Modung the rock changes to gneiss.

Above Modung, and scarcely 2 miles from the foot of the glacier, is the last village, called Ata. The living glacier system comprises the main Ata glacier, length 10 miles, thus making it the longest known glacier east of the Tsangpo; the Chömbö south glacier, length about 6 miles; and the Cheti glacier, length about 4 miles; together with a number of much smaller hanging glaciers. The Chömbö south and Cheti glaciers almost, but not quite, unite with the main Ata glacier. This last ends at an altitude of 8000 feet, very much lower than most Himalayan glaciers.[1]

At Ata there still lives a craftsman who makes "elegant wooden cups," as observed by A. K. These cups, or *tsamba* bowls, are turned on a crude reciprocating lathe from the wood of *Acer stachyophyllum*, a small tree which grows scattered in the temperate forest with *Magnolia globosa*, *Rhododendron fulvoides*,

[1] According to Wadia, the Sikkim glaciers do not descend below 13,000 feet. Only in Kashmir does a glacier descend so low as 8000 feet ('Geology of India,' by D. N. Wadia).

Taxus Wallichiana, *Pinus excelsa*, and many other trees. In the undergrowth of this temperate mixed forest are *Podophyllum versipelle*, *Primula chungensis*, *Vaccinium modestum*, and several species of Arisaema.

Early in June we went into camp in the forest at nearly 9000 feet, up the Chömbö glacier, with a fine view of the snow-peak itself. Chömbö,[1] which I estimated to be 22,000 feet, is said to be the highest peak on this section of the range, at any rate visible from the south. It does not however give origin to the largest (Ata) glacier. It is well seen from the foot of the Ata glacier; from a few miles up the side valley, and from near the Ata Kang La itself; but I could not see it from the other side of the range owing to numerous intervening peaks. As seen from the south, Chömbö is a perfect dome; actually there are two peaks, one due north of the other.

The Ata glacier has three concentric moraines on the ice near its snout, derived from the subdividing of the two lateral moraines. Each lateral moraine divides into three, and each pair curves round to meet at the snout, thus forming concentric ridges, the apex pointing downstream. Probably each marks a stage in the shrinking of the glacier. The glacier foot is covered with rubble for a mile, and dirt bands are very conspicuous in the ice-cliff at the foot. Big longitudinal troughs, filled with roaring torrents, occur in the ice; the crevasses are mostly wrinkles, and not conspicuous. On the right bank of the Chömbö glacier, and on the left bank of the Ata glacier, are stranded moraines above the present ice-level. They are covered with forest trees, the largest of which near the summit may be two or three hundred years old.

In June we followed the path up the left bank of the main (Ata) glacier, camping the first night in the forest at a spot called Shukdam. On the second day we bore away from the glacier, which now filled the gorge, and ascended very steeply up the granite face of the range which, as seen from below Ata, fills the horizon. On the tree-line, at about 13,000 feet, we reached a camping-ground called Chutong. Here we spent a fortnight, waiting for the snow to melt. I found here an alpine flora similar to that on the mountains of far northern Burma to the south-east. There is no water supply at Chutong, and we were dependent on snow: there was plenty of it. Sedimentary rocks outcrop. Above Chutong a band of hard limestone and slate forms a savage escarpment overlooking the Cheti glacier. This escarpment is crossed by the Cheti La at 14,000 feet altitude, whence the Cheti glacier is reached. The ascent to the Cheti La from the Chutong side is easy, but the descent of the scarp face is difficult. The shaft down which the trail goes is almost a chimney, and owing to a snow cornice overhanging the pass, it was hardly possible to get into the chimney, or, having got into it by descending the even more precipitous cliffs on either side, to get out again, before the cornice had disappeared. Thus, although Kaulback and I managed to descend the chimney so early as June 28, our coolies could not cross the Cheti La until July 10.

Near the Cheti La I saw monal pheasants (*Lophophorus sclateri*) and snow pigeons (*Columba leuconota*); while in the Fir forest birds in considerable variety were seen. Of plants endemic to the mountains of Tibet, western China, and the Himalaya, I may mention three species of Nomocharis and two of Cremanthodium; *Meconopsis horridula* (a form with pale blue flowers),

[1] A. K. called the whole snowy massif by the name Nimbutchumburi.

Paraquilegia microphylla, *Rhododendron repens*, and other species, *Primula dryadifolia* var. *congestifolia*, and others, *Cassiope myosuroides*, and *Anemone rupicola*.

The core of the range consists of a white granite with green chlorite and dark fine-grained pegmatite inclusions. But in addition to igneous rocks—granite and gneiss, there are altered sedimentary rocks on the flanks. Near Chutong a belt of these sedimentaries, slates, limestones, and shales has been caught up between masses of igneous rock and pushed this way and that. The strike of these sedimentary rocks is always about north-west to south-west: they dip at angles of 45°–85° to the southwest. After crossing the Ata Kang La the granite soon gives place to slates, then limestone again, still dipping south-west. On July 10 we crossed the Cheti La (14,268 feet), descended the shaft towards the tributary glacier from the Ata Kang La, and traversed along the base of the cliffs, heading up the glacier valley. Crossing several snow chutes, and climbing up and down the cliffs, we reached a lateral moraine, and presently camped on a gravel platform on the side of the glacier. Here we spent five days.

On July 15 I parted from my companions, who returned to Rima and thence crossed the Diphuk La into Burma, a route I knew well, having crossed the Diphuk La three times. I crossed the Ata Kang La, and on the following day reached Lhagu, the first village in Nagong. The ascent to the pass is toilsome, but not difficult at this season. The glacier was well covered with snow, and only one steep and broken part was at all troublesome. We kept well over to the east wall, in spite of the fact that many small avalanches from the steep snowfields and hanging glaciers pour down on this side. The Ata Kang La, about 16,000 feet, is a broad gently sloping saddle, with high rocky peaks all round. Ronald Kaulback accompanied me to the summit, where I parted from him with regret. Six months later I learnt that the two of them reached Fort Hertz safely.

From the saddle the ice flows in three directions, south towards the Ata glacier, north towards Lhagu, and eastwards. The glacier originates on a high peak immediately to the south-east of the pass, and descends in a crevassed and seraced cascade on to the saddle, which is nearly a mile wide. To the immediate west is another fine peak, from which an independent glacier flows, to join the northern foot of the Ata Kang glacier. The descent to the north is gradual at first. Presently we got on to very slushy ice, sinking in over our ankles at every step. After about 2 miles the glacier descended steeply to the snout, and we stepped off on to a terminal moraine. The other glacier from the west also ended abruptly here, the two torrents uniting and flowing down a broad stony valley. The altitude of the glacier foot was 14,367 feet, as compared with 8000 feet on the Zayul side !

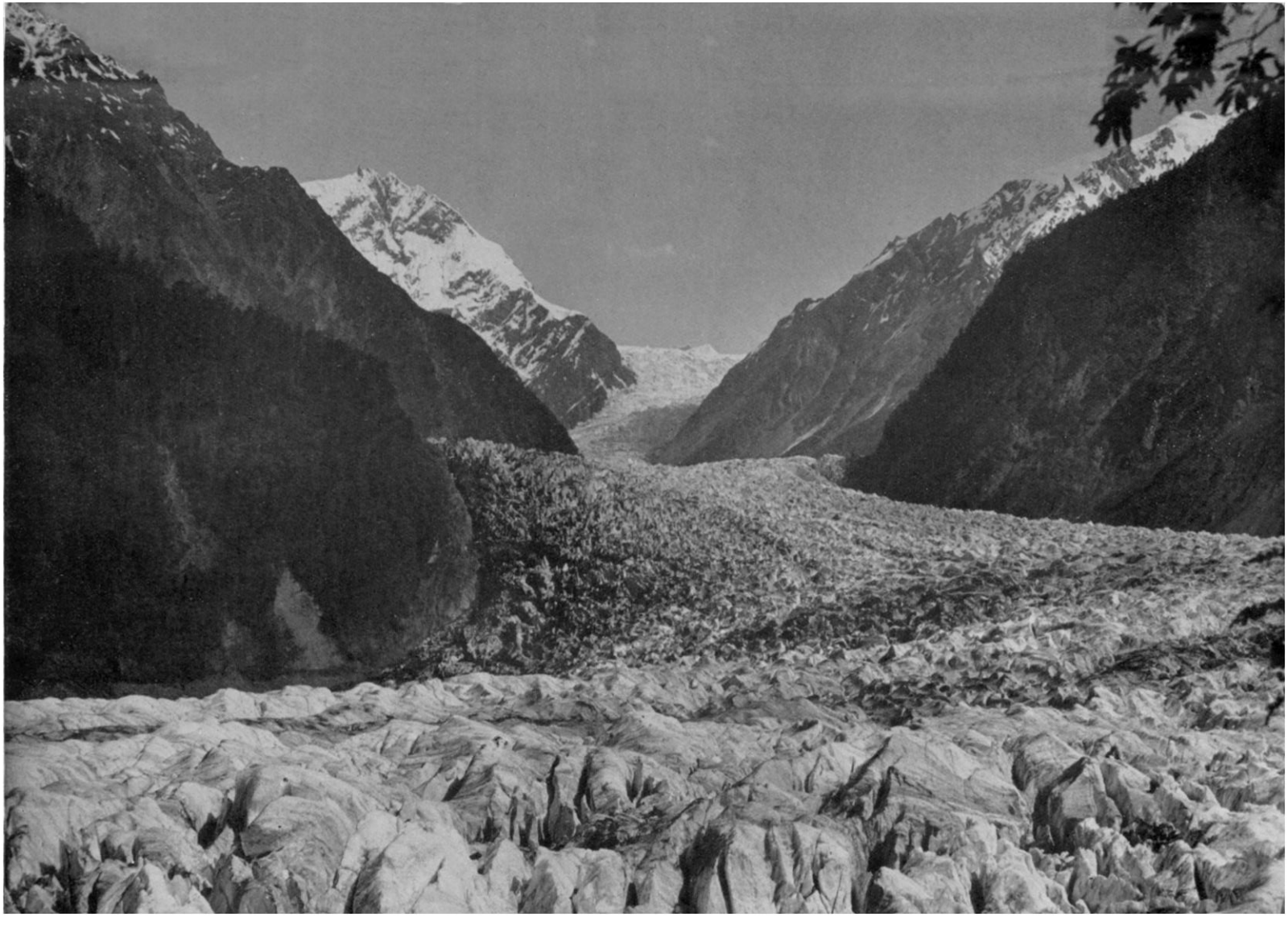
After crossing the pass everything changed abruptly: scenery, people, vegetation, birds, and mammals. As to the vegetation, there is no forest, and the only big tree is a Fir—*Picea lichiangensis*. Small Poplars and Birch trees appear down the gorge of the Nagong chu, shrubs occur in fair variety, but essentially the flora of Nagong and the country to the north of Shugden Gompa is alpine. It differs considerably from the alpine flora we had met with in Zayul. Amongst birds, choughs and magpies appeared for the first

time, and many species familiar in Zayul were no longer seen. There were several kinds of babbler, besides larks and rose finches. Amongst mammals, the familiar squirrels and the marten and flying squirrel of the Zayul forests were replaced by hares and marmots. The butterflies of Nagong are entirely Palaeartic: those of Zayul are closely related to south China species.

On the second day after crossing the Ata Kang La we reached a small scattered village called Lhagu, at an altitude of 13,207 feet. The houses, built chiefly of mud and stone, are half underground, being built against the side of the hill. Just before Lhagu is reached the torrent plunges into a gorge, but through a band of slate (strike N.W.–S.E.); it then flows through a small silted-up lake basin, and cutting through another band of slate enters the Lhagu lake, the upper end of which is also rapidly silting up. A steep glacier almost reaches the silted-up lake from the eastern range, and six other glaciers may be seen aloft. To the west, up the broad glacier above the lake, three high isolated pyramidal snow-peaks are visible. A little farther to the south, amongst ice-rounded hills, is a group of lakes, all connected with one another. The uppermost is fed by four hanging glaciers, forming an icy curtain. Beyond the lake is another large valley-glacier. It is obvious that the whole of this region has been intensely glaciated. The Lhagu lake is held up by a glacier from the west; but the stream breaks out along its foot, and enters a broader valley, at the far end of which is the lake of Shugden Gompa. The snow-peaks in the south-west, seen through the wide gap caused by the Lhagu glacier, are very striking objects; and the glacier itself is some miles in length. The glacier ends in a blue ice-cliff owing to the undercutting of the lake stream; every now and then a large splinter of ice breaks off and falls into the torrent. This ice-cliff is visible from Shugden Gompa.

From Lhagu to Shugden Gompa[1] is a long march, following a path cut out of the cliff high up on the right bank. Only at Yatsa, where a big torrent descends from the Zo La, does it touch the valley bottom, until the lake at Shugden itself is reached. The bridge described by A. K., which was still there when Colonel Bailey visited Shugden Gompa in 1911, no longer exists. The lake has been supposed to be about 4 miles long and more or less round. One of the first things I did was to measure a base at Shugden Gompa on a level grass plain (an old lake basin) north-east of the monastery, and make a plane-table sketch of the district. I found the lake to be about 10 miles long, shaped like a Norwegian fjord, with an arm to the west where the Nagong river flows out. Just below the monastery a considerable river, called Tzengu chu, rushes through a limestone gorge into the lake. This is the third source-stream of the Nagong river. The fourth source-stream comes in from the north. All four sources rise in small hanging glaciers. Immediately opposite to Shugden Gompa, crowning the opposite limestone cliff across the Tzengu gorge, is a small temple called Tzongjo, containing a famous image of Buddha. The west side of the lake is very precipitous, as the snowy range practically overhangs the water. There is a very conspicuous sugar-loaf limestone peak here, called Dorjetzenga, with glaciers on its northern face. This peak is visible from the Zo La, halfway to Sangachu Dzong: from the foot of the Ata

[1] Spelt Shiuden on maps. The Tibetan spelling however is ཤུག་ལྡན་དགོན་: Shugden Gon (Gompa); the *g* in Shugden is not pronounced.



The great Ata Glacier from the south

Kang glacier just above Lhagu, and from a spur to the north, where the lake makes its bend to the west. Thus it is extremely useful to the surveyor, in a district where outstanding peaks are rather remote. More than that, the peak is the top of a broken syncline, the strata having the same strike as the limestone outcrops near the monastery, that is to say, north-east to south-west. Taken together with what I saw later of the rocks farther north, this was indisputable evidence for a fold chain continuing the Himalayan alignment.

The climate of Shugden Gompa is dry and cold: the winters are severe, and the lake freezes, so that ponies can cross the narrow part. There is no forest, but trees—*Picea lichiangensis*—grow in the more sheltered valleys. Descending the valley of the Nagong river one quickly comes to real forest; but in no other direction. There are shrubs in considerable variety, wherever there is shelter from the perpetual tearing wind that blows down the valley of lakes. But the real glory of the country is the wealth of alpine flowers which carpet the crisp crumbling soil. From 14,000 to 17,000 feet they cover hill and dale, between June and October, Anemones, species of Oxytropis and Astragalus, Primulas, Saxifrages, aromatic Salvias, Cremanthodiums, prickly blue Poppies, Incarvillea, Dracocephalum, Geranium, Trollius, and many others; but the finest of all are the autumn flowering Gentians, which carpet the earth with millions of vivid blue cups. There are at least five species. Needless to say, in so dry a country, there are few Rhododendrons, but those few are decidedly interesting.

Having been well received at Shugden Gompa and comfortably installed in the fort, I decided to go to the Salween. I had crossed a great range of mountains, and there appeared to be another range ahead of me—at least I had to cross a pass in order to reach the Salween.

In 1924 Lord Cawdor and I had seen a magnificent range of snow-peaks north of the Tsangpo trending more or less east and west. What was the relation of that range to the range on which I stood? Was it the Tsangpo–Salween divide, and did the Salween cut through it? If the Salween cut through this range north or east of Shugden Gompa, then on Burrard's argument that the Tibetan rivers cut through the Himalaya at the point of maximum elevation, not only might it flow in a deep gorge, but the gorge might be flanked by peaks of outstanding height, and the river would follow a course much less straight than that tentatively assigned to it on our maps.[1] On the other hand, if that great snowy range curved round to the south between the Salween and Tsangpo rivers (as depicted on small-scale maps), then by travelling northwards I ought to reach it.

I left Shugden Gompa on July 30, following in A. K.'s footsteps for the first three days. The road goes north, to join the highway between Chamdo and Lhasa. As far as Shugden I had found A. K. pretty accurate in his statements; but he seems to have fallen off after this, and neither his map nor his diary were of much help to me.

After passing the north end of the lake we climbed a spur above the fourth and last source stream of the Nagong river, and saw several big snow-peaks to the west, continuing the great range into Pome. These peaks were probably

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

close to those Lord Cawdor and I had seen from the west ten years previously. On the second day we crossed the Poyü Tsonge La just below which is a small lake, the Poyü Tso, with no visible exit. It owes its origin to an earth fan which has blocked the flat valley below.

There were several herds' tents here, with large flocks of sheep and goats, besides yak. Legend says that when the water in the lake is low, the Dalai Lama is unwell; when it is high he is in good health. At present the water-level was high, and when I passed this way again in October it was still high. Once, rumour says, the water disappeared entirely, with what dire results I did not learn. After crossing the pass, and counting numerous glaciers on both sides of the road, we descended a stony valley, and came to a wretched village called Guba. A mile farther on however the valley opened out, where another big stream came in from the Pome mountains. There was plenty of cultivation here, and excellent grazing. Conspicuous at the junction of the two streams was a magnificent mediaeval fortress-like building, which was actually the monastery of Rambu. Beside it was a smaller building, the *dzong* or fort officially called Shoshi Dzong but known locally as Drongsa Dzong, after the village close by.

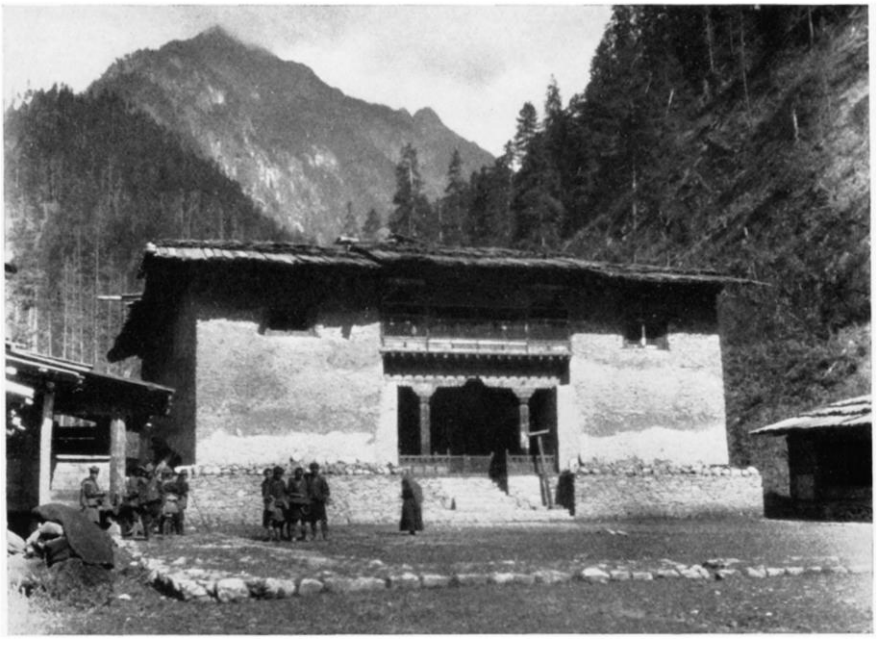
Up the western valley were several small villages, a nunnery called Mani Labrang, and another monastery called Autakpag. The *dzong* was deserted: apparently no one coveted the job. The monastery was almost deserted; and considering that there must have been at least fifty houses in the neighbourhood, one might say that the village was deserted too, so few people did we see about.

Next day we marched down a rather arid rocky valley, following the stream called Tsa chu, which by next day had become a river. We passed a number of small villages and monasteries, and towards evening reached a dingy monastic fort, or fortified monastery, called Trashitze Dzong. A friendly aged monk, who was also the civil magistrate, put me up for the night, and arranged for fresh transport. He said I would have to change transport many times on the next stage: it was the custom. However he promised to let me off a few changes, at the less conspicuous villages through which we should pass. The road to Pashu and Lhodzong continues northwards from Trashitze Dzong, leaving the valley and crossing a high mountain; our road turned off to the east, still following the valley of the Tsa chu, so at this point I parted company with A. K.

There is a special type of *mani* pyramid found here. The inscribed stones are laid flat on a large coffin-shaped platform contained by a low stone wall. The platform has a definite slope from head to foot, and the inscriptions all face down the slope and are easily read. The whole resembles a large, slightly decrepit grave. Nagong and the *dzong* districts in this valley are all under Pashu. A *Dzongpön* does three years' service and then goes back to Pashu, and is sent elsewhere. Nagong was formerly under Sangachu Dzong, but was at its own request transferred to Pashu. Zayul however includes territory to the north-east of Shugden, as far as the Salween river. The Tibetans reck little of what we call "natural" frontiers.

On the following day I should have reached Gongsar Gompa, that being the full Tibetan stage; but owing to the frequent delays of changing transport

Chorten at Shugden Gompa



Monastery near Putsang, the last village in the Rong Tö chu

The Salween River at Puti

and to a violent storm towards dusk which flooded a stream we had to cross, we halted at a village some way short of our destination. There were villages on both sides of the river, which was spanned by frequent bridges: the total population in these few miles could not have been less than five hundred, and the valley seemed to be interminable. In the villages were a few small trees, otherwise the valley was treeless. On August 3 we marched eight hours, but owing to a long delay at Gongsar, could not make up the distance lost the previous day. There is a fine monastery at Gongsar, with sixty or seventy monks, and the village contains about forty houses. It was a real oasis in the bare valley, with fruit trees, and familiar garden flowers in tubs and boxes, and a lot of cultivation. I was shown the skins of three snow leopards.

The country from Trashitze Dzong to the Salween is composed of alternating bands of bright red sandstone, similar in appearance to that met with on the Mekong in north-west Yunnan, limestone, and slate. The rocks have been thrown into great north-and-south folds, the dip varying from 45° to 90°. Owing to the sharp colour contrast where snow-white limestone meets cinnabar red sandstone, the arches are very conspicuous. If these rocks are of the same age as those of north-west Yunnan, then clearly the Indo–Malayan mountains were involved in the Himalayan earth movements, and must belong to the Himalayan range. If, on the other hand, they should prove to be of Eocene age, then they are a direct extension of the Himalayan uplift itself.

After passing the well-to-do villages of Aule and Watak, we found the river burying itself deeper and deeper into a narrow gorge, and there being no longer a path below, we had to climb to a considerable height up the arid cliff. The scenery and vegetation were those of Tsarong. The heat became stifling, as we descended to lower and lower levels; it was difficult to believe that we were still 10,000 or 11,000 feet above sea-level. Myriads of flies in the hot dark houses were the only real discomfort. After climbing by a rugged path till we were more than 1000 feet above the river we crossed a spur and saw below us another river flowing from the south almost as large as the Tsa chu; the two joined below, and flowed northwards in a deep impassable gorge to join the Salween. On the right bank of the new river, called the Zigar chu, and far above us, was the road to the Salween; obviously it would take us some time to reach it. The rest of the journey was a succession of terrific ascents and descents. The general level of the plateau through which the Salween has carved its valley is about 15,000 feet, and the river can only be reached from the edge of its valley at plateau-level, since all tributaries bury themselves in impassable gorges. As the Salween flows at 9000–10,000 feet, this involves a big descent.

I spent the night at Puti, a small village halfway down the side of the Salween gorge; on the following morning I went down into the river-bed to get a boiling-point, and other data. The Salween[1] was in flood, a swift turbid mass

[1] Gyama Ngu chu; also called Dza chu or Dza Khog Ngu chu, the last two names probably confined to the headwater streams north of Lhasa. According to some Tibetans, ngu=དངུ་, and means "sweat." Dza means earth or clay, and the idea is that the water is sweated out of the earth. The name would have no meaning in the gorge country, and it is difficult to see why the Rong Tö chu should be called Zayul Ngu chu.

of yellow water flowing at about 10 knots. There were no falls: such rapids as there were were caused by boulders in the river-bed. The uniform level of the plateau was remarkable. From the top I could see many small glaciers and snow-peaks on the range behind me, but I could see no snow to the east or north.

It was now clear to me that since leaving Ata I had crossed, not two ranges, but one, the Tsangpo–Salween divide, which is the Himalayan extension. After crossing the Ata Kang La I had descended no more than 3000 feet, to the lake at Shugden; then I had ascended 2000 feet and crossed the Poyü Tsonge La, whence I descended to the Salween. The Nagong river, rising on the Tsangpo–Salween divide, has followed the strike of the rocks for some distance to the north-west; then it probably crosses the range northwards, and before joining the Tsangpo cuts across it again, southwards. This crossing of the range accounts for the gorge at its lower end, above its junction with the Tsangpo. As for the Salween: it cuts across no mountain range here, but 100 miles to the south it flows in a great gorge between Menkong and Chamutong. I explored this gorge in 1913 and again in 1922. The snow-range is here trending south-east, and the Salween flowing due south crosses it between Ka-Karpo to the east and a snow mass to the west.

After leaving the Salween I returned to the Zigar chu, called Yindru chu, higher up, and followed it southwards through a well-populated valley. Reaching the alpine region I once again saw glaciers and snow-peaks in front of me. On August 11 we crossed the Traki La, 18,487 feet, over a rocky range with many small corry glaciers and hanging glaciers. This brought us into the valley of the Tzengu chu, which we followed back to Shugden Gompa. The peaks on either side of the Traki La rise to 20,000–21,000 feet, the rock being granite; near Shugden Gompa we got back on to limestone and slates. There is a considerable alpine flora even as high as 17,000–18,000 feet. A species of Lagotis, *Draba alpina*, *Primula macrophylla* (in fine bloom), a Sassurea and an Allium are amongst the highest species.

Towards the end of August I went two days' journey to the west, down the lake to its exit as the Nagong river. This is as far as ponies can go, the path then becoming bad. After turning west from the north end of the lake, the valley is filled with Fir forest. We passed two villages on the north bank of the lake, and saw a log raft being broken up and many poles being carried by yak to Shugden Gompa. There was no doubt where the lake ended, for the silence was shattered by a roar as the Nagong river plunged into a profound gorge; at the same time the rock changed once more from limestone to granite, though farther west is a high limestone range, forming the backbone of Pome. Up a valley on the left bank of the river I could see the peaks of the great snow range.

We camped at the boundary of Nagong with the semi-independent Pome country: it was said to be two days' march to the next village. The Pobas bring their herds up as far as this, but do not come to Shugden Gompa, neither do the Tibetans go down the Nagong river. Pilgrims from the Tsangpo valley (Chimdru district) however use this route annually. Starting from Shingki Dzong on the Chimdru chu, they descend to Kapu, on the Tsangpo, ascend the left bank, following the route taken by Bailey and Morshead in 1913,

cross the Sü La, and ascend the Nagong chu to Shugden Gompa. Thence they travel by the Zo La to Sangachu Dzong and Rima, returning north by the Rong Tö river, which they follow to its source, crossing the Kangri Karpo La, and so back to Shingki Gompa. The round trip takes anything up to two or three months, and is only possible between July and September; but pilgrims often take a year, crossing one snow pass the first year, spending the winter in Zayul, and crossing the second snow pass the following year. By this pilgrimage a considerable slice of the snow range is circumambulated. But Chömbö is not really an important place of pilgrimage, it has no more than a local reputation. The three most famous peaks in Tibet are, according to the head lama of Shugden Gompa: Tö Kang Ri,[1] Lho Tsa Ri[2] in southern Tibet; Ka-Karpo ("Kagurpu") in Tsarong.[3] I give them in order of altitude, according to my informant.

One of the lamas of Shugden had brought me a fine Primula in July, telling me he had picked it on a hill not far from the monastery. I paid several visits to the hill, but was unable to locate it. However when I asked if he might accompany me to the spot the head lama said that he could not let him off his studies at present: term would not end for several weeks. I repeated my request at intervals, and at last the lama said that if I would send to the monastery three *trankas* to provide a substitute he would give my friend a half-holiday. The money was sent, with a scarf, ponies provided, and we rode off to the hill. The lama went straight to the spot, and though he had only my description of the flower to go by, and it was long since over, he showed me the plants ripening their seed. The whole incident left me with a very agreeable impression of these monks.

Though there was no forest round Shugden Gompa there was a certain amount of scrub, and here birds and also hares were plentiful. I frequently put up coveys of small partridges at 14,000–15,000 feet. There were several species of babbler, red-beaked choughs, rose finches, larks, hoopoes, and pigeons. But I saw no larger animals. In the ponds there were toads (*Bufo viridis*).

On September 6 I set out for Sangachu Dzong on the main road to Zayul and the south, camping the first night in a wide gently sloping glaciated valley. The stream, which flows to the south end of the lake, has cut a deep trench through the gravel floor of the valley, and is invisible until you are almost on top of it. Small glaciers are seen on the flanking ranges to east and west. Next day we ascended the valley, crossed the flat, almost imperceptible watershed,

[1] Tö Kang Ri—probably Kailas, usually called Kang Rim-Po-Che. Tö Kang Ri might mean any sacred peak in upper (*i.e.* western) Tibet, towards Ladakh. There is one near Mount Everest in Nepal.

[2] Lho Tsa Ri. On the older maps of Tibet, Tsa Ri is marked as a peak, close to the intersection of 93° E. and 29° N. According to Bailey and Morsehead, Tsari is a *district*, in which there is a sacred mountain called Takpo Shiri. There can be no doubt however that there is a sacred peak called Lho Tsa Ri, as I am assured by that distinguished Oriental scholar, Dr. Van Marnen, "Lho" means south (ལྷོ); "tsa" is grass, but by extension, any green vegetation. Lho Tsa Ri is a forested mountain, near the headwaters of the Subansiri.

[3] Ka-Karpo is probably the highest peak of the three. It might be 22,000 or 23,000 feet high. I have marched round it.

and following the source-stream of the eastern Zayul river till it entered a ravine, climbed up to the Zo La (Jo La) which crosses a spur of the range. Down the ravine where the torrent flowed I could see several snow-peaks and glaciers of the great range. From the Zo La I looked down the wooded valley of the east Zayul chu, and saw Sangachu Dzong, perched on a spur. A steep descent brought us to the edge of the forest, where we camped. Next day we reached the main river again, and shortly after, Sangachu Dzong. As usual the *dzong* was deserted, the monastery almost so, but there were a number of people harvesting their crops in the fields. Colonel Bailey spent a day here in 1911, and apparently he is the only other white man who has visited Sangachu Dzong. Since his visit the old *dzong* has been rebuilt, and it is now quite a fine structure.

A large torrent flows in from the south-west, and up the valley the snow-range can be seen. There is a path to Lhopa, and to Suku, on the Ata stream, the only direct communication between the two branches of the Lohit river. From Sangachu Dzong also a road goes over the mountains eastwards to the Salween, and thence northwards to Chamdo. The monastery and fort stand cheek-by-jowl on a shoulder, high above the cultivation and many hundred feet above the river, which flows in a deep trench. There are four villages below, which take it in turn to supply services to the *Dzongpön*, each village doing three days' work. I took a latitude observation here and found the map position to be several miles in error. Above the monastery there is a great limestone cliff on which I found many interesting plants. On the return journey I went back to Lhagu, and thence to the foot of the Ata Kang glacier; I also explored the lake district here, and the big glaciers to the north-west which feed the lakes.

I now realized (i) that the eastern Zayul river, like the Nagong river, rises *on* the Salween–Tsangpo divide; (ii) that the Zo La crosses a spur, not the main divide; (iii) that the flat watershed between the Sangachu Dzong river and the stream flowing to Shugden is in the interior of the Tsangpo–Salween divide; it does not cross it. Both streams rise on, and flow some distance along, the watershed. In other words, the main watershed is not crossed between Shugden Gompa and Sangachu Dzong; it lies to the east and north-east along the high rocky divide which overlooks the valley of the Salween. The Traki La, which I had crossed in August however, does lie on this high sierra, and therefore crosses the divide. The average width of this great range for a distance of about 100 miles in this region, between the Tsangpo and the Salween, is 40–50 miles, which is considerably less than the width of the Himalaya west of the Tsangpo bend.

On September 20 I returned to Shugden Gompa, and a week later set out to cross the Salween divide, if possible, by another pass. We followed up the Tzengu chu as though going to the Traki La, but turned off just below the pass up one of the wide-mouthed valleys towards the hanging glaciers. My guide had never been here before, but thought we might reach a pass. However when we reached the foot of the sierra at about 17,000 feet he gave up, and said there was no pass. Some of us then went off to look for one, and reached the top of a saddle, finding a snowfield on the other side. Below we could see yak grazing. With some difficulty the ponies and yak reached this

pass, just as a heavy snow flurry blotted out the view. We descended the snow slope, the ponies sinking deeply into the soft snow. Presently we reached an unsuspected glacier, luckily not much crevassed. Eventually we reached the pasture below, where there is a small lake at the foot of the glacier. Looking back at the glaciers which now filled the head of the valley, one would have said that there was no pass, and that we could not possibly have crossed with our baggage animals. While descending the glacier we saw a herd of Tibetan gazelle (*Gazella picticaudata*) ascending the snow slope in single file. When they saw us they began to leap and run. There were eleven of them, three being very young, the rest full grown.[1]

On the following day we discovered that we had reached the source of the Yindru river, and were back in the valley we had ascended from Zigar in August. Shortly afterwards we passed the mouth of the valley leading to the Traki La and came to some herds' tents. As I did not wish to descend to Zigar, we turned off here up a wide valley, whence we could descend to Shoshi Dzong, taking one of the herds to show us the pass. We crossed the pass, a wide saddle flanked by a glacier, next day, and descending a long valley eventually emerged close to Shoshi Dzong. From there we returned *via* the Po Yü La to Shugden.

On October 20 I recrossed the Ata Kang La. Considerable changes had taken place in the glacier since July, and we followed a different route from the summit, keeping well over to the right side, and at one point, owing to crevasses and seracs, leaving the glacier altogether, and scaling the cliffs. Eventually we crossed the glacier below the ice-fall, near our old July camp. Though there was a good deal of fresh snow on the surface, partially filling some of the crevasses, a very fair trail showed us the way, and we met coolies from Ata on their way to Nagong, carrying heavy loads of wooden articles, such as gun stocks and tea churns. There was a great deal of gravel on the lower portion of the glacier and stones were continually dropping into the crevasses. This had been going on all the summer. After a few days' halt at Modung, I went down to the Rong Tö chu with the object of following it up as far as possible. A long day's march from the mouth of the Ata river brought me to Putsang, the last village. This account of my subsequent travels in the Rong Tö valley has already been given up to the end of November.

My work was now in early December finished for the season. To vary the journey back to Assam I decided to go from the village of Dri over the Dri La into the Delei valley, and thence down to the Lohit river. We reached Dri on December 2 and spent several days here making arrangements for the journey. It was not easy to find coolies who were willing to go all the way to Sadiya, and nothing less was of any use: it is difficult to engage Mishmi coolies, particularly at this season, when they are dispersing into the country, and I had no mind to be held up indefinitely at some small village. Consequently we decided to scour the neighbouring Tibetan villages for men who were willing to go through. This meant carrying food for all for fourteen days, and increased the number of coolies.

We travelled light, sending the kit not required by coolie to Rima, whence one of my men would take it down the Lohit valley to Sadiya. Even so, I found we required fifteen coolies, though my own loads were light. For

[1] Tibetan དགོ་བ་ (gowa). Perhaps the Tibetan ravine deer, *Piocapra picticaudata*.

interpreter amongst the Mishmis I engaged Wunju, headman of Giwang, himself a hunter who had several times been to Sadiya. He sold salt to the Mishmis, and acted as agent for them when they came over to the Rong Tö to buy cattle.

The weather was still beautifully fine, but it could not be trusted indefinitely. Sooner or later there would be another snowstorm in the hills, and although the Dri La is said to be crossed, even by Mishmis, right up to the end of December, a snowstorm just at the wrong moment might cause a fatal delay. We started from Dri on December 9, ascending through the Pine forest until we overlooked a big torrent which came in a couple of miles lower down the valley. The torrent flowed down a terrific forested gorge. The granite cliffs were almost vertical and the path was not easy. Dense thickets of Rhododendron, including eight or ten different species, lined the cascades. On the second day's march the path converged on to the upper glaciated part of the valley. The vegetation here was more like that of the Mishmi Hills. A short march on the third day brought us to the head of the valley, where there was a large lake, half frozen over. From the lower end of the lake the bearing of the pass was 235°, or almost due south-west, while the high peak called Parangkon bore 187°. Down the valley we faced north-eastwards to the Rong Tö, which was less than 10 miles distant. Directly above the lake rose a high snow-covered wall, at the top of which was the Dri La,[1] a knife-edge ridge between two rocky points. During the day a large party of Mishmis crossed the range and stopped at our camp, surprised to see me. The lake at the foot of the pass was at a height of about 10,500 feet, so we had some 2500 feet to climb next day.

We started soon after dawn, and owing to the depth and softness of the snow took five hours to reach the top. It was a gloomy day, a cold wind blowing up from the south threatening snow. From the Dri La I again looked down into Assam, a lather of cloud sweeping over the high snow-clad ridges which separate the Delei headwaters from the Dou and the Lohit. I was looking almost due east, not south. There was not nearly so much snow on the Assam side, and after crossing a belt of loose boulders we got on to firmer ground and descended rapidly towards the extreme head of the Delei valley. Towards dusk snow began to fall heavily, and we camped on the edge of the Rhododendron forest. Next day we entered the forest, near the birthplace of the Delei river. Deep snow lay everywhere, and was still falling heavily. It was obvious that we had crossed the pass only just in time, a fact brought home to us the more vividly when several shivering Mishmis, turned back by the change in the weather, joined us. However it was an unusually brief storm. That night the weather cleared up, next day the snow was melting and falling in wads from the trees, and within a day or two we were meeting parties of Mishmis on their way up to Zayul once more.

For the next four days we were marching through temperate forest, descending gradually, and crossing several large streams which flowed through wide valleys, and had their sources right back on the watershed. The Survey of India map sheet shows only two such torrents between the Dri La and

[1] The Dri La (from the village of Dri) is the Tibetan name for the pass called Glei Dakru on the Survey of India Sheet. Not to be confused with the Dri river, the source of the Dibang.

Tajabum, the first Mishmi village: actually there are five; but the surveyors did not go right up the valley, sketching in its head from a considerable distance. Hence these errors of detail.

On the 16th, after a long march, we camped at dusk in a strip of forest which I recognized as the very spot I had halted at in 1928 when for the last time Mr. H. M. Clutterbuck and I tried to reach the Dri pass. We were then camped on a cleared ledge overlooking a cliff called Chache, above the village of Tajabum. We had reckoned on Chache being within three or possibly four marches of the pass, making due allowance for inaccuracies in the map. But actually, descending the valley it took us five days from our camp immediately below the pass, to the bridge below Chache; it would have taken us longer going up, and still another day to cross the pass. In fact in 1928 we were not so close to the Dri La as we had supposed.

On December 17 we traversed the open precipitous face, some 3000 feet above the Delei river, and descended the frightful path to Chache and thence to Tajabum, which we found deserted. Chache, which is only a small camping-ground on the precipitous cliff side, near a stream, was cleared by a Chinaman who came from Rima to spy out the Delei valley when the Chinese occupied Zayul about 1912. The Chinaman liked the look of the Delei valley so little that he went no further, and returned whence he came: or perhaps it was the Mishmis he disliked. Having found Tajabum (three huts) empty, and having passed about fifty Mishmis making for Dri and left another fifty in the Rong Tö valley, I thought that possibly the entire population of the upper Delei migrated into Zayul during the winter. However our passage of the river was opposed by three men who tried to cut the bridge just as we arrived. Being but a flimsy bamboo structure, it did not need much tampering with to put it temporarily out of action, and we only just foiled the demolition party. It transpired that this was not done with the object of preventing us from crossing, but with the object of making us pay a ransom before being allowed to pass. The plot failed, nor were we again interfered with.

The group of villages which centres round Peti was in a flourishing condition. Every one seemed prosperous. The huts are large and well built, the permanent cultivation never looked cleaner or more fertile. There were not less than a hundred Mishmis here, so the exodus to Tibet was by no means complete. The villages at the top end of the Delei valley traffic with Zayul, those at the lower end with Sadiya. The deep ravine at the village of Meiliang, which has its sources on the peak called Polon (where Clutterbuck and I spent a hectic autumn in 1928) marks the line of division. The two sections of the valley, while not actively hostile, are emphatically not well disposed towards one another. Tibetan influence is growing here. Jackets made of Tibetan woollen cloth, prayer flags round the graves, even the jewelry worn by women, testify to it.

We left Peti on December 20. It is nominally six stages to the Lohit, nine to Theronliang: that is the time we had taken on the way up in 1928. On the return journey however I had actually reached Theronliang in six forced marches. I do not however recommend any one to try and cover the distance in six days, and certainly I had no intention of making forced marches now. Actually we took eight days to Theronliang. The path from Peti to Minutang,

up and down over the steep spurs, is bad; from Minutang to the Lohit, in the river-bed, is worse, on account of the cliffs. But the most difficult and tiring march in the whole Delei valley is unquestionably that from Peti to Tajabum.

The maize had all been plucked, and the cobs were stacked in the fields, in bamboo bins covered with roofs of matting. Two huts I noticed protected by a fence of spiked bamboo, with a gate moving in the vertical plan, raised by a counterweight in the form of a large stone. One would have surmized that this was a protection against human enemies; but more probably it was a protection against less tangible evils—the devils of sickness and misfortune. At this season the Mishmis were building new huts, or renovating old ones.

Ever since the two days' snowstorm after crossing the pass the weather had been superlative. This was lucky, for the cliffs below Minutang are hazardous at any time, and almost impassible when slippery with rain. The fine weather held till we reached the Lohit valley road on Christmas Day. That night it rained, but in the course of the following day it cleared up again, and by the time we reached Theronliang on the afternoon of the 27th the brief storm had passed. Never have I been so lucky with the weather on the North-East Frontier.

There is little to add about the vegetation of the Delei valley. Peti practically marks the boundary between the temperate forests and the Indo-Malayan hill jungle. Near Peti there grows—or did grow—the only known wild plant of *Leycesteria crocothyrsos*, which I discovered here in 1928. I looked for it again, but failed to find it: perhaps it had been cut down. However it is now in cultivation. I noticed the change to Indo-Malayan forest, birds, and mammals immediately we left Peti, and frosts were a thing of the past. Above that village, Rhododendrons, Oaks, Acers, Magnolias, Lauraceae, Bucklandia, Carpinus and similar trees abound; and above that again, Coniferae. Below Peti, Palms, Pandanus, species of Ficus, Derris, Acrocarpus, and other tree Papilionaceae, Bauhinias, Ulmus, Araliaceae Sterculias, Pterospermum, and similar trees are equally abundant, with an undergrowth of Strobilanthes and, on rocks, Begonias.

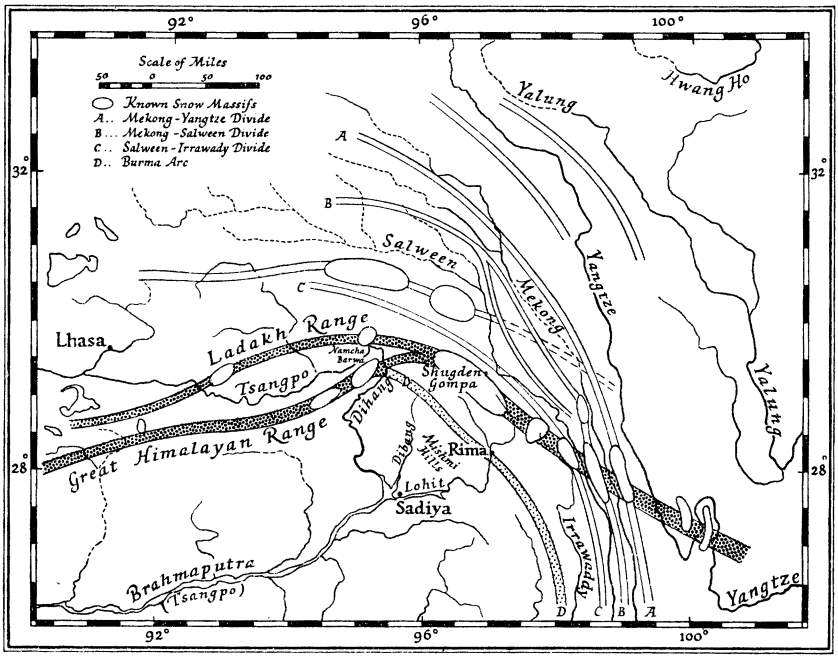
There must be a great many fish in the Delei, to judge from the number of bamboo fences built halfway across the river. At night a fire is lit on the end of the fence, and the fish are speared as they come to the light. There are many cormorants, and also such typical birds as honeysuckers, babblers, and the coppersmith are seen, or more likely heard.

We now met Mishmis returning from Sadiya. Many of them spoke some Assamese; they were less shy, and more talkative than the suspicious natives of the upper valley. Yet even they were obviously surprised to see me: it is very rarely that a white man is seen beyond the administered frontier of Assam—more's the pity.

On the 28th I double-marched over the Tidding Saddle to Denning Post, where the Political Officer met me with his car and motored me the remaining 45 miles to Sadiya.

It will be convenient to add a few notes on the controversy of the eastern Himalayan extension. The view that the Himalayan range does extend east

of the Tsangpo gorge has been held by several authorities, notably by Prince Kropotkin and by the late Professor J. W. Gregory. It was opposed by most geologists, and by that distinguished geographer Sir Sidney Burrard, who suggested that the Ninchin Thangla range—presumably an eastward extension of Sven Hedin's Trans-Himalayan range—curved round to the south, and became the lofty Salween–Irrawaddy divide. If that was so, then farewell to the Himalayan extension: the Himalaya must end before it abutted on the Salween–Irrawaddy divide. Further, if one great meridional range was admitted, why cavil at half a dozen! But Burrard held that view a quarter of a century ago before the discovery of the Assam Himalaya, with its great peak Namcha Barwa; before Sven Hedin's work was published; and before Gregory



Suggested alignment of the Himalayan and Ladakh Ranges

went to Yunnan. Lately, Burrard has accepted the conclusion that the Himalayan range is prolonged eastwards.[1]

In spite of the resemblances between the western China and Himalayan floras, as pointed out by Hooker, there appeared to be discontinuity. Balfour rather stressed the differences between the flora of Yunnan and that of the eastern Himalaya. Further exploration has only emphasized the continuity: Yunnan plants were subsequently found in the Himalaya, and Himalayan plants found at any rate east of the Tsangpo.

A. R. Wallace, on the other hand, insisted on the connection between the eastern Himalaya and Malaya particularly in bird life. The advance of the

[1] 'A Sketch of the Geography and Geology of the Himalayas and Tibet,' Burrard and Hayden. (Second Edition, 1933, revised by Burrard and Heron.)

ice during the glacial epoch and the similarity of climate to-day account for that. But the main Himalayan relationships lie eastwards across China to Japan and Formosa, not southwards towards the Malay Archipelago.

Finally there was the evidence of travellers who described the great rivers flowing southwards, separated by great ranges of mountains. It would be hard for any one travelling westwards from China, south of the Tsangpo bend, to deny the evidence of his senses, and say that the great mountain ranges trended parallel to his line of march, when his days were spent in endless ascents and descents. Yet if he kept a little farther south he would have a less arduous journey, and if he kept a little farther north, a much less arduous journey.

Between the parallels of 27° and 30° he is in the river-gorge country, and that is a part of the Tibetan plateau in the third stage of demolition. The mountains are decrepit, but they have been rejuvenated, and the rivers are virile. By keeping a little farther south he reaches old country which has been mellowed; the mountains are lower, their outlines softened. By keeping farther north he finds himself on a more level plateau in the earlier stages of demolition with the mountains separated by trough valleys lying more or less parallel to his route. A great mountain range may be 100 miles *wide*. A river cutting through it will then form a gorge 100 miles *long*. A leash of rivers cutting through it close to one another will form a series of parallel gorges 100 miles long separated by spurs or ridges, which may take on the appearance of separate parallel ranges of mountains, particularly if the rivers cut through at a point of maximum elevation. This is exactly what has happened between the Tsangpo bend and the great hook bend of the Yangtze at Likiang. The celebrated naturalist, Brian Hodgson, made the same mistake about the Himalaya. He contended that the Himalayan high peaks stood at the ends of spurs projecting southwards from the edge of the Tibetan plateau and not on a continuous range. To-day no geographer doubts the continuity of the great Himalayan range. Wadia himself has shown how this appearance has come about by the cutting of transverse gorges.

The Himalayan rivers however between the Indus and the Tsangpo are of secondary importance compared with the great Tibetan rivers. They do indeed rise behind the crest-line of the Himalayan range; but they have not captured the drainage of the great Tibetan troughs as the Tsangpo and other major rivers have done. They are also comparatively far apart, so that the blocks into which they have cut the Great Himalayan range have not so much the appearance of long narrow meridional ranges between the gorges. Nevertheless the two phenomena are strictly comparable. It is only in a comparatively narrow belt of country about 120 miles wide (the thickness of a great mountain range) where the parallel rivers flow in deep narrow gorges flanked by snow-peaks, that the appearance of meridional ranges is produced. North and south of this belt the country is plateau-like. The meridional range effect is of course enhanced by the fact that the grain of the original Altaid uplift happens to be north-south. This grain is still there, but is more or less concealed in the foundations, since the Altaids must have been worn right down to the base. The Himalayan earth movement then superimpressed the alpine grain which was thenceforth the true grain of the country, going to the

very roots of the mountains. Later events again impressed a north-south grain on the country, which, corresponding more or less with the Altaid uplift, was not unnaturally taken for the true grain. It has almost completely obscured the effect of the Himalayan uplift, except at certain notable spots; and it has made the unravelling of the geology and geography of this region singularly difficult. To sum up. A great climatic barrier stretches across the country from the head of the Tsangpo gorge, eastwards or south-eastwards towards the Yangtze. A climatic barrier of the first order is necessarily also a biological, and often also a human, barrier. The fact that the original grain of the country, reinforced by the southward flowing rivers, is athwart the barrier, tends to conceal it. The truth of its existence rests upon the following evidence.

Climatic.—If any of the great river gorges are followed up, the climate is found to change within the course of a few miles, from moist to arid. The change takes place in the neighbourhood of snow-peaks without any great change of altitude in the river-bed. This change is most noticeable in the Tsangpo and Salween valleys, less so in the Mekong and Yangtze valleys.

Topographical.—All the four great rivers cut through deep gorges. If the known snow-peaks are plotted on the map they are found to fall within a belt about 50 miles wide, which runs diagonally from the top end of the Tsangpo gorge to the great bend of the Yangtze at Likiang. The river gorges are cut through this belt. North and south of this belt of high peaks the country falls away to a more uniform plateau level.

If the southern limits of the former glaciation are plotted, the ice-shore is found to extend along the southern foot of this range, and all the lesser southward-flowing rivers rise on its southern flank.

In the neighbourhood of Nagong the actual snow-range can be seen stretching for at least 50 miles in a direction approximately north-west to south-east.

Botanical.—Crossing the snow-range in Nagong there is a change in the flora as complete as that seen crossing the Himalaya in Sikkim. But this is equally true even when following up a river gorge, such as the Tsangpo or the Salween. No sooner is one behind the great range than one finds a totally different flora. East and west across the river gorges, and the apparent grain of the country, the flora is more uniform (according to altitude, and to which side of the range it belongs) than it is north and south along the apparent grain. The existence of so many Eastern Asiatic woody plants on the Himalayan range can only be explained by the extension of the Himalaya.

On the meridional ranges, a change occurs in the alpine flora where the great snow-peaks intervene. South of Ka-Karpo on the Mekong–Salween divide, for example, there is one alpine flora, which may be called Indo-Himalayan; north of it is a different alpine flora, related to that of the Tibetan plateau country (Sino-Himalayan). To find a continuation of the Indo-Himalayan flora one must look to the ranges west of the Salween (the Salween–Irrawaddy divide) and east of the Mekong, the Mekong–Yangtze divide. Similarly, a Sino-Himalayan flora is found east and west of the Mekong-Salween divide. The difference between the alpine flora of the Mekong–Yangtze divide, say, and the Salween–Irrawaddy divide, south of their respective snow-peaks, is

not greater than that observed in passing along the Himalayan range from Nepal to Bhutan.

Zoological.—There is a change in the animal life corresponding to the climate and vegetation change. Mammals found south of the barrier include the takin, gooral, serow, black bear, yellow-throated marten, flying squirrel, clouded leopard, and barking deer; north of the barrier occur snow leopard, Tibetan antelope, marmot, hare, and wild ass.

Geological.—In Nagong the sedimentary rocks have been thrown into folds by pressure from the north or north-east. These rocks are probably identical with those observed by Gregory in Yunnan, that is to say, they are of late primary age, and have been affected by the Himalayan earth movements. According to the views here advanced, the Himalayan range stretches from the Indus to the Yangtze and probably to the Pacific coast. It consists of two parts: the main part, from the Indus to the Tsangpo, of Cretaceous age, was, at the time of the Tertiary uplift, at the bottom of the Tethys. The extension from the Tsangpo eastwards was at that time part of a plateau worn down from the Indo-Malayan mountains which had long been dry land. This plateau was uplifted and folded exactly as the bottom of the Tethys was uplifted and folded, the whole forming one great range. Lines of weakness developed at the junction, and in the rejuvenation of the ancient plateau. As a result, first glaciers, and then rivers found a way out here.[1]

No explanation of the eastern Tibetan ranges which fails to take account of them all will suffice. If this view explains the relationship existing between the eastern Himalaya and the high peaks between the Tsangpo bend and the Yangtze bend, it must also explain the snow-range north of the Tsangpo. In the *Geographical Journal* for February 1926 I drew attention to certain other peculiarities of the eastern Himalayan and Tibetan ranges.

Firstly: Whereas in travelling from the Chumbi valley to the Tsangpo two ranges are crossed, *viz.* the Great Himalayan range by the Tang La, and the Ladakh range by the Karo La, in the neighbourhood of the Tsangpo gorge, only *one* range separates the upper Tsangpo from the Dihang. If one crosses the Doshong La from Pe on the Tsangpo one arrives on the Dihang and eventually in Assam without crossing a second range. What then has become of the Ladakh range? I suggested then that it is continued on the north bank of the Tsangpo, which cuts across it in a gorge east of Tsetang.

Again, it was supposed that at the entrance to the great gorge the Tsangpo was cutting through the main axis of the Great Himalayan range. The two high peaks, Namcha Barwa and Gyala Peri, were cited as flanking the gorge, Gyala Peri continuing the main axis of the Himalaya. But Gyala Peri lies due

[1] According to Wadia ('Geology of India') "all the great Himalayan rivers are older than the mountains they traverse." This may be true of the Indus, but needs to be proved for the four eastern rivers. It does not account for their proximity and parallelism. Gregory states categorically that during Pliocene times the drainage lines of the Tibetan rivers were formed by meridional fracture at the same time that great basins were being formed by subsidence. The Mekong, for example, flows down a cracked syncline, as is proved by the rocks dipping away from the river. ("The Alps of Chinese Tibet and their Geographical Relations," by J. W. Gregory and C. J. Gregory, *Geogr. J.*, March 1923. See also Philosophical Transactions of the Royal Society of London, series B, vol. 213, 1924.)

north of Namcha Barwa, so that unless we imagine the Himalayan range to change direction to the north quite suddenly at this point, these two peaks cannot be on the same *crest line*, though they might indeed be on the same *range*.

Thirdly, to the north of the Tsangpo gorge Lord Cawdor and I saw a mighty range of snow-peaks. These we naturally assumed were on the Tsangpo–Salween divide. How then do they fit on to the snow-range I crossed last year? Further, what is *their* relation to the Namcha Barwa–Gyala Peri group? These questions cannot be answered yet with any certainty. A glance at the map on page 389 will however show their suggested relationship. Dr. Wadia's excellent work on the geology of Kashmir is no argument against the views here put forward. The history of the western Himalaya has not necessarily any bearing on that of the eastern Himalaya: each must be judged on its merits.

The grasshoppers of the north-western Himalaya, for example, as pointed out by B. P. Uvarov, belong to groups which have no connection with those of the eastern Himalaya. The former are related to tropical Indian species; the latter spread from the ancient Angara continent (eastern China) and are very different.[1]

APPENDIX: NOTE ON THE AMPHIBIANS AND REPTILES

DR. MALCOLM SMITH

The collection of amphibians and reptiles obtained by Captain Kingdon Ward on his last two expeditions to Upper Burma, Upper Assam, and the adjacent regions of Tibet, although not large, is of considerable value and significance. The region visited is of particular interest in that it is the meeting-place of the eastern Himalayan fauna, which belongs mainly to the Indo-Chinese subregion, and the Trans-Himalayan, which is Chinese in origin. Of the 16 species collected, 7 are known from China or Yunnan, and 3 from the Himalaya; the remainder are widely distributed or are peculiar to the region visited. The Tibetan collection considerably extends the range of several species; some of these show also slight differences in morphological characters or in colour pattern from what has hitherto been recorded.

In consideration of the high altitudes at which most of the specimens were obtained it is of interest to recall the heights to which amphibians and reptiles have been known to ascend in that part of the world. In southern Tibet a toad, *Scutiger alticola*, lives at 16,500 feet; a frog, *Altirana parkeri*, at 15,000 feet; and the agamid lizard, *Phrynocephalus theobaldi* is said, in some places, to be common at between 15,000 and 17,000 feet altitude. In the Himalaya the Scink, *Leiolopisma himalayanum*, ascends to 12,000, and *L. ladacense* to 14,000 feet. Wall has described a snake, *Natrix baileyi*, from Tibet which lives at 14,000 feet. Such a height however is quite exceptional for a snake, and it may have been the unusual conditions under which the species lives that enables it to survive. According to the natives who obtained them they "live in the sides of a hot spring and are never found as far as half a mile distant." Another snake of the same genus, *N. platyceps*, ascends in the Himalaya to 10,000 feet, and some of the Pit Vipers (*Trimeresurus*) live at great elevations. Captain Kingdon Ward's specimens of *Trimeresurus jerdoni* appear to be a record in altitude for the genus.

[1] *Annals and Magazine of Natural History*, October 1927.

Amphibians

Specimens were obtained of *Megophrys minor*, *Scutiger sikkimensis*, *Bufo viridis*, *Bufo stuarti*, and *Rhacophorus maximus*.

Lizards

Specimens were obtained of *Japalura splendida*, *Calotes kingdon-wardi* (new species), and *Lygosoma indicum*.

Snakes

Specimens were obtained of *Natrix nuchalis*, *Natrix subminiata helleri* (considerably larger than any previously recorded), *Elaphe mandarina*, *Elaphe taeniura taeniura*, *Ptyas korros*, *Zaocys nigromarginatus*, *Trimeresurus jerdoni*, and *Trimeresurus monticola*.

DISCUSSION

Before the paper the PRESIDENT (Major-General Sir PERCY COX) said: You all know the subject of the lecture, but in repeating the title I feel a certain amount of responsibility as to the pronouncement of the name of the famous mountain-range. Since my youth I have called it Himălāyă; but I find that the pundits no longer agree to that pronunciation. They seem more or less unanimous in calling the range the Himālăyă, so I ask you to adopt the same pronunciation.

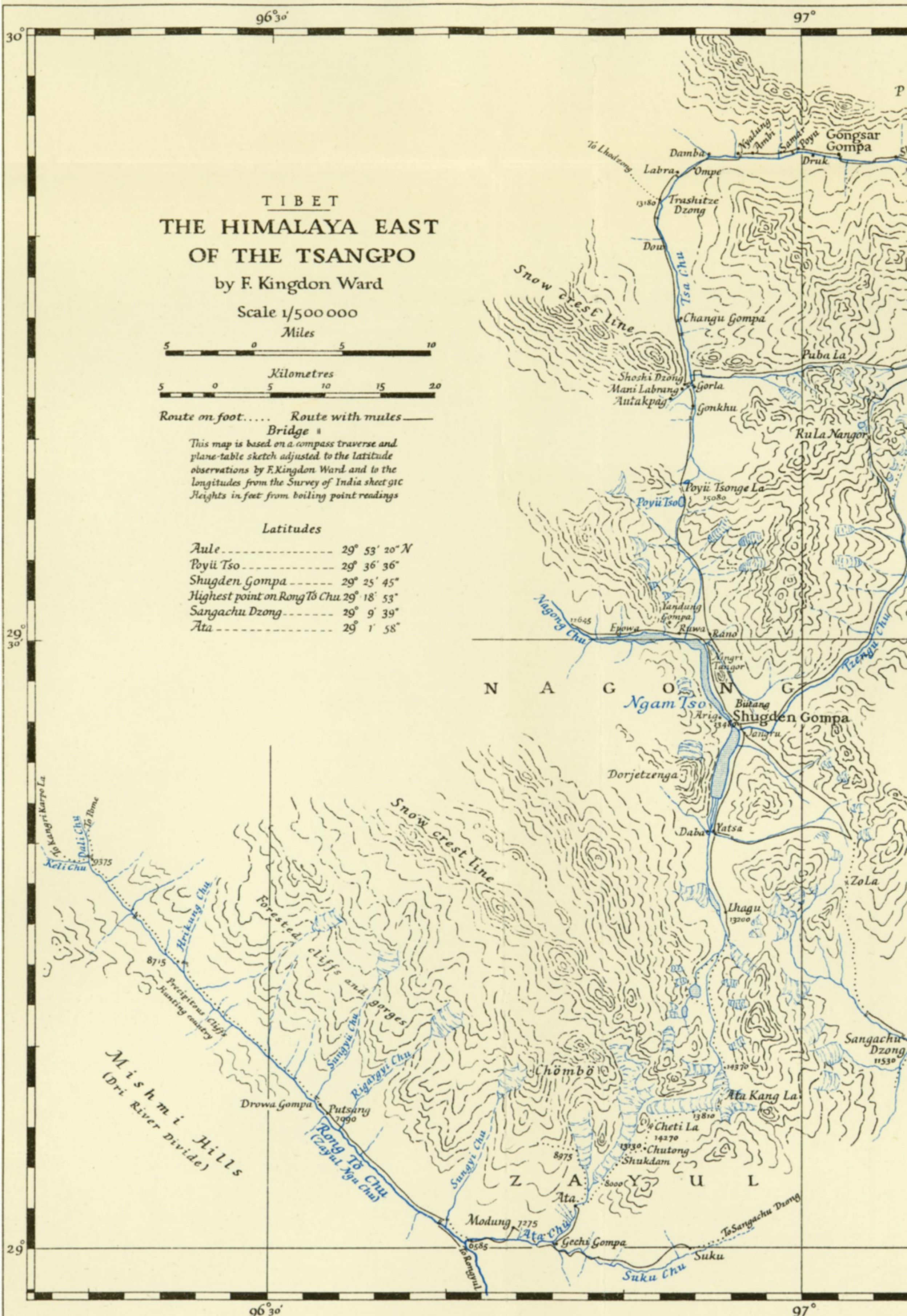
The lecture is on the Himalaya east of the Tsangpo gorge. As regards the lecturer, I feel it almost an impertinence to speak of introducing him, for he really needs no introduction. All I need say is: "Here is Kingdon Ward back again." As we all know, he has been a traveller and explorer for twenty-five years past and has repeatedly given lectures from this platform and written a great deal in the Society's *Journal*. He was a Gold Medallist in 1932. He has now returned to England from another interesting trip, and I am sure, if he has his own way, it will not be his last in that fascinating region.

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

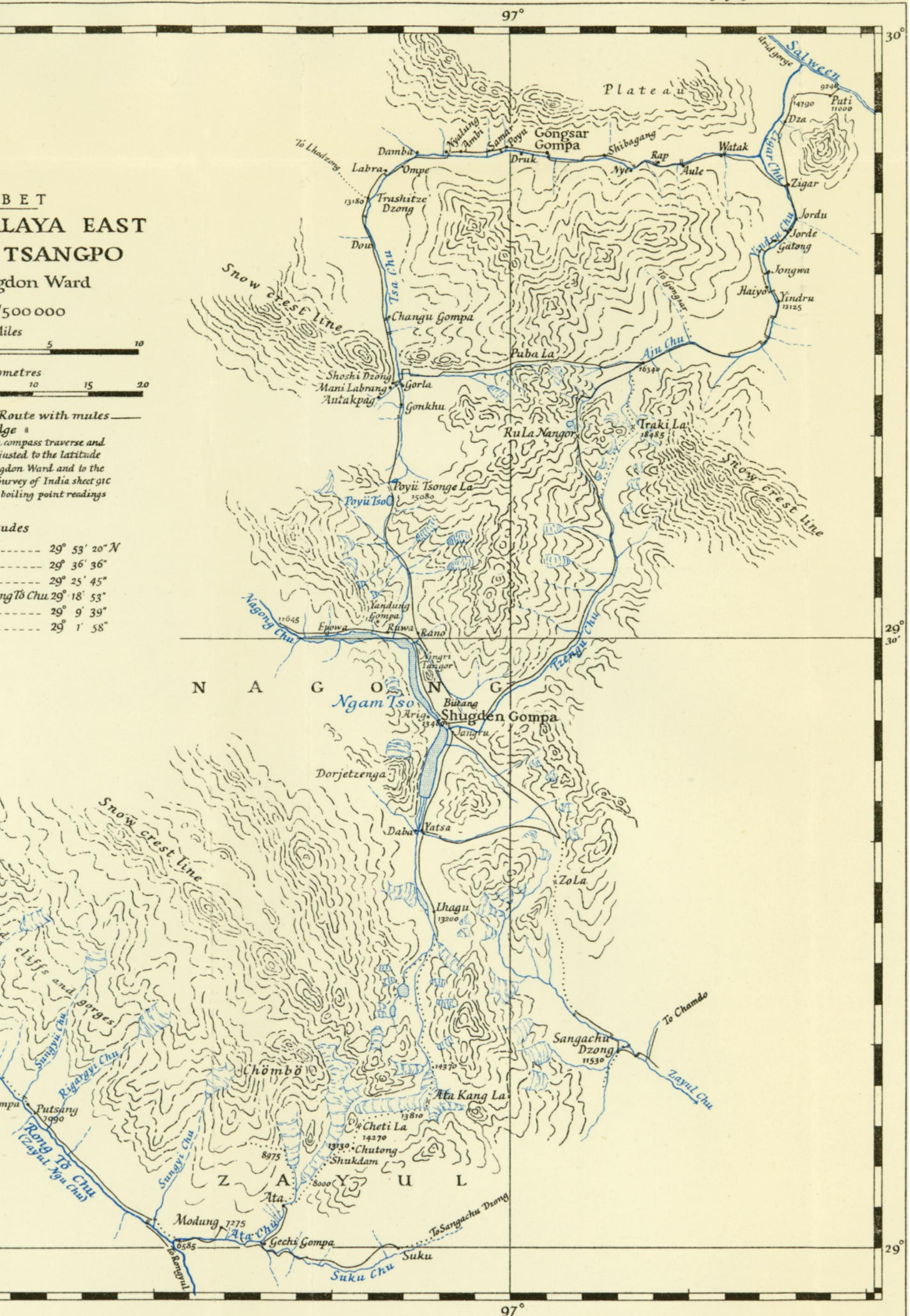
Colonel F. M. BAILEY: It is many years since I was in the part of the world described to-night, and I think I might tell you what took me there. I had an idea that some one might get into the country round the bend of the Brahmaputra from the Chinese side. The problem of that river had been talked of a good deal. There had been somewhat feeble efforts to approach it from the Assam side, and there had been discussion in 1904 as to approaching it from Lhassa, and I had an idea that somebody might get into this part of the world from China, especially if they knew Tibetan and could travel among Tibetans and were independent of Chinese official help which always involved Tibetan opposition. That was what took me to Shugden Gompa.

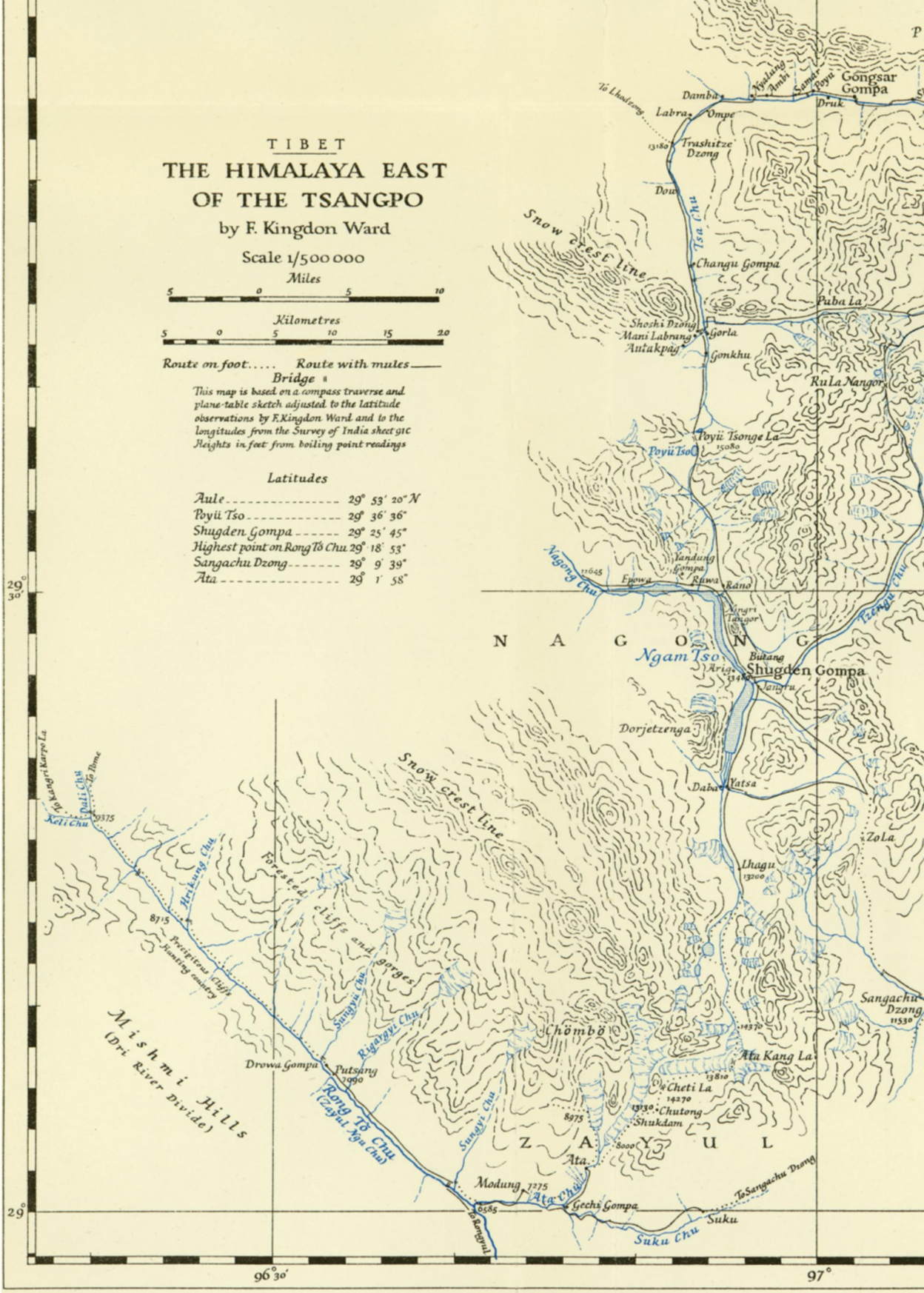
Kingdon Ward was prevented from going down the valley to the west. So was I. I had no intention of stopping at Shugden, but when I got there I was unable to move. Down the valley there was a war, and the natives claimed that they had killed 3000 Chinese. I went back into that country two years afterwards and was told that I had been misinformed, the figure was 1700. Whatever the number, it was impossible for me to proceed. No one would help me or carry my loads. I was told it would be certain death to go on; that the Chinese might take me for one of the enemy and the enemy might take me for a Chinese! That was what stopped me in Shugden and made me return along the same route, against my will.

I do not want to enter into a discussion as to the way in which the Himalaya run because that seems a somewhat controversial topic, but when on the part



TIBET
THE HIMALAYA EAST OF THE TSANGPO
by F. Kingdon Ward
Scale 1/500 000
Miles
5 0 5 10
Kilometres
5 0 5 10 15 20
Route on foot.....
Route with mules
Bridge
This map is based on a compass traverse and plane-table sketch adjusted to the latitude observations by F. Kingdon Ward and to the longitudes from the Survey of India sheet 91C
Heights in feet from boiling point readings
Latitudes
Aule 29° 53′ 20″ N
Poyü Tso 29° 36′ 36″
Shugden Gompa 29° 25′ 45″
Highest point on Rong Tö Chu 29° 18′ 53″
Sangachu Dzong 29° 9′ 39″
Ata 29° 1′ 58″
96°30′
97°
30°
29° 30′
29°
NAGONG
ZAYUL
Snow crest line
Snow crest line
Forested cliffs and gorges
Mishmi Hills (Dri River Divide)
Precipitous cliffs
Hunting country
Gongsar Gompa
Damba
Nyalung
Ambi
Samar
Poyu
Druk
To Lhodzong
Labra
Ompe
13180
Trashitze Dzong
Dou
Tsa Chu
Changu Gompa
Puba La
Shoshi Dzong
Mani Labrang
Autakpag
Gorla
Gonkhu
Ru La Nangor
Poyü Tsonge La
15080
Poyü Tso
Nagong Chu
11645
Epowa
Yandung Gompa
Ruwa
Rano
Ngri Taigor
Tzengu Chu
Ngam Tso
Butang
Arig
Shugden Gompa
13480
Jangtu
Dorjetzenga
Daba
Yatsa
Zo La
Lhagu
13200
Sangachu Dzong
11530
To Kangri Karpo La
To Pome
Dali Chu
Keli Chu
9375
Hrikung Chu
8715
Sungyu Chu
Rigaygyi Chu
Chömbo
14370
Ata Kang La
13810
Cheti La
14270
Chutong
13130
Shukdam
8975
Drowa Gompa
Putsang
7990
Rong Tö Chu
(Zayul Ngu Chu)
Sangyi Chu
Ata
8000
Modung
7275
Ata Chu
6585
Gechi Gompa
To Rongyul
To Sangachu Dzong
Suku
Suku Chu


97°
30°
29° 30'
29°
BET
LAYA EAST
TSANGPO
gdon Ward
/500 000
Miles
metres
Route with mules
compass traverse and
justed to the latitude
gdon Ward and to the
Survey of India sheet 91C
boiling point readings
udes
29° 53' 20" N
29° 36' 36"
29° 25' 45"
ng Tö Chu 29° 18' 53"
29° 9' 39"
29° 1' 58"
Salween
Arid gorge
Plateau
Puti
11000
Dza
Zigar
Zigar Chu
Jordu
Jorde
Gatong
Yindru Chu
Jongwa
Haiyo
Yindru
12125
Watak
Rap
Aule
Nye
Shibagang
Gongsar Gompa
Druk
Poyu
Samar
Ambi
Kyalung
Damba
To Lhodzong
Labra
Ompe
Trashitze Dzong
13180
Dou
Tsa Chu
Snow crest line
Changu Gompa
To Gongsar
Puba La
Aju Chu
16340
Shoshi Dzong
Mani Labrang
Gorla
Autakpag
Gonkhu
Ru La Nangor
Traki La
18485
Snow crest line
Poyü Tsonge La
15080
Poyü Tso
Yandung Gompa
Nagong Chu
11645
Epowa
Ruwa
Rano
Ngri Tangor
Tzengu Chu
N A G O N G
Ngam Tso
Butang
Shugden Gompa
Arig
13480
Jangru
Dorjetzenga
Daba
Yatsa
Snow crest line
Zo La
Lhagu
13200
cliffs and gorges
To Chamdo
Sangachu Dzong
11530
Zayul Chu
Chömbö
14370
Ata Kang La
13810
Cheti La
14270
13130
Chutong
Shukdam
8975
Sungyü Chu
Rigargyi Chu
Sungyi Chu
Putsang
7990
Rong Tö Chu
(Zayul Ngu Chu)
Z A Y U L
8000
Ata
Modung
7275
Ata Chu
Gechi Gompa
6585
To Rongyul
To Sangachu Dzong
Suku
Suku Chu
97°



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TIBET
Kingdon Ward

of the Brahmaputra reached later by Kingdon Ward and Lord Cawdor, one afternoon I went out to try to find a road, or rather a way through the forest by which people had moved (that was by finding trees or branches cut with a knife and not broken off). Major Morshead and I had done a lot of this, in the hope of finding a way down the valley. On this occasion I went out with no camera and no compass, and for about five minutes the sky, which was usually overcast, cleared, and right away in the distance to the north-east I saw one prominent snow-peak, but I never saw it again and had no idea exactly where it was. Morshead said he thought it must be the Himalaya! So we all had those ideas even in those days. Captain Kingdon Ward mentioned Sangachu Dzong. I stopped there twice: once on my way up to Shugden Gompa, and once when I was forced to go back. I carried with me as presents for the monastery, photos of the Holy Lamas of Tibet taken in Calcutta at different times. I presented one to the Dalai Lama on my way up and one to the Tashi Lama on my way back. I wonder whether they are still in the monastery. Perhaps Captain Kingdon Ward saw them there. They would be put on the altar with scarves round them.

Professor KENNETH MASON: I did not expect to be called upon this evening and my very old friend, Captain Kingdon Ward, did not let me look at his paper beforehand. I should have liked a little notice of the question of the extension of the Himalaya. If you will excuse me, sir, I will not correct my pronunciation. I was brought up to pronounce the name Himáláyă, and when we formed the Himalayan Club, about six years ago, Sir Geoffrey Corbett and other officials of the Government of India discussed the question with Sanscrit and other language experts in India in order to ascertain whether we should call ourselves the Himálâyan Club or the Himālăyan Club. The conclusion of these experts was that Himālăyă was wrong, and that already English people pronounce the last two syllables almost in the correct Sanscrit and Hindi way. We have therefore been the Himálâyan Club ever since, and I hope we shall remain so.[1]

I am going to avoid being in any way dogmatic about the eastern extension of the Himalaya. There are theoretical and structural geologists who believe that the outer and lesser Himalayan ranges bend right round Assam and are continued by the Arakan Yoma of Burma; and that they appear again as the Andaman islands and on the islands of Sumatra and Java. On the other hand, Gregory, Kropotkin, and others have put forward the theory that the Alpine-Himalayan range lines extend across Yunnan and South China. If this is so, it seems to me to revolutionize our ideas on the Alpine-Himalayan system of mountain-structure, because the ranges, where we know them well, appear to have been pressed up from the site of the old Mesozoic geosynclinal Tethys sea of sedimentary rocks and, as far as we know, the area in which Mr. Kingdon Ward puts his Himalayan extension was not under the sea at the time, but was part of the Asiatic land-mass.

I would mention one other point. Dr. D. N. Wadia, of the Geological Survey of India, has carried out some very interesting and valuable work on that great syntaxial bend of the Himalaya in the north-west of India, and has shown that the Himalayan ranges in the north-west bend right round the Indian peninsular foreland. The strike and orographical trend change from SE.–NW. on the east of the foreland, through E.–W. on the north of the foreland, to NE.–SW. west of the foreland. It is extremely tempting to compare the north-east and the north-west ends of the Great Himalayan arc—so tempting, indeed, that we must not be tempted.

[1] See "The Word Himalaya," by Sir Geoffrey Corbett, *Himalayan Journal*, vol. 1, 1929, p. 84.

The PRESIDENT: Mr. Ramsbottom, who is in the Department of Botany in the British Museum, has old family traditions with this Society; but I am asking him now to tell us of the successes Kingdon Ward has had on this occasion on the botanical side of the expedition.

Mr. J. RAMSBOTTOM: Fortunately, I have not to discuss either the twisting round of the mountains or their names. At the same time I would say that having been brought up on Himălāyă, I shall stick to that, no matter what anybody says.

I can however speak with every confidence regarding the botanical results that Kingdon Ward has achieved. The President mentioned that Captain Kingdon Ward has been exploring botanically for twenty-five years. He did not mention that Kingdon Ward also took part in the Great War, which took away a number of the years of his collecting life. You will readily understand that botanists, at any rate, are extremely grateful to Captain Kingdon Ward for the dried specimens which he has brought back for botanical study, the other aspect of his work being the collecting of seeds for botanical gardens. It is here that I have what the President has called a family connection, just the same as I have with your Society.

The collecting and drying of overseas plants as botanical specimens may be said to have begun with the journey of Sir Hans Sloane and the Duke of Albemarle to Jamaica in 1689. These plants formed part of the collection of Sir Hans Sloane now in the British Museum, which were part of the original collections which started the British Museum. Sir Hans Sloane's collections from Jamaica began the idea of introducing plants and seeds on a scientific basis. Previously seeds had been brought back by travellers and sailors, and they had been grown in various gardens.

There was first the American period when William and John Barton, Garden, and various others sent seeds to Ellis and Peter Collinson; then there was the Australian period when Sir Joseph Banks and Robert Brown collected. That, incidentally, is my family connection. Robert Brown, who was the first Keeper of the Botanical Department of the British Museum, was one of the founders of your Society. You will see in the Museum the collections that Robert Brown made on Flinders's voyage and those that Banks made when with Cook.

During the last thirty or forty years there has been a period of horticultural and botanical investigation of the Himalaya and Western China. It is possible to send out botanical expeditions if one can obtain the necessary financial support by collecting seeds for those who have gardens. The modern idea is much the same as that of Banks, though he was fortunately sufficiently wealthy to act as a patron. He sent out expeditions to collect seeds and to obtain botanical specimens. The seeds were for the Kew Garden, which was the Royal Garden; the herbarium specimens he kept, and later these came to the British Museum; the living plants were drawn either abroad or at Kew, and these drawings are also in the British Museum.

In recent years there have been journeys to seek for new plants in Tibet, Nepal, Bhutan, Sikkim, and various provinces of Western China, and, if I may say so, there is no name more honoured amongst modern collectors than that of Captain Kingdon Ward. His present collections number something like 750 and comprise about 5000 plants. If you think of the trouble entailed in drying the plants in some of these regions and carrying them over passes and through gorges, keeping insects away and not getting yourself and the plants drowned, you will understand that it takes a man with the courage and experience of Kingdon Ward to undertake that task. Not only does he collect the plants which we are very thankful to receive, but he knows a very great deal about them. You

know him best perhaps as a lecturer, but he is a botanist of considerable experience, as he ought to be, because, as many of you know, his father was one of our most famous botanists, a man whose memory I revere, since it is to him that I owe my own career. Professor Marshall Ward was Professor of Botany at Cambridge for many years, and I am sure nobody would be more proud of Kingdon Ward than his father, who was a laboratory botanist and practically the founder of the modern scientific knowledge of plant diseases. Kingdon Ward himself is, in my opinion, without a peer in botanical exploration.

The PRESIDENT: The evening is getting on, so it now remains for me to thank Mr. Kingdon Ward. I am sure you must all have been astonished, as I have, at the extraordinarily beautiful coloured pictures which he has shown us, indicating as they do what great progress has been made in the direction of colour-photography. I have never seen such fine photographs of Nature taken in colour on the spot as I have seen this evening. Mr. Kingdon Ward is a very experienced photographer, as we know of old, but still, I think the photographs are really a great achievement.

As regards the pronunciation of the name of the range of mountains I am personally rather glad that the feeling of the company is with Himălāyă. I know there are some Himălăyăns in the audience, but they evidently find themselves in a minority.

I ask you now to join with me in congratulating Mr. Kingdon Ward on what he has accomplished on this expedition, not only as a botanist but as a good geographer who knows what to look for and the great problems that still remain to be solved in that region. We cannot attempt to debate here the solution of the problem of the limits which must be assigned to the range to the eastward, but it has been very interesting to hear the points that have been made regarding it. I ask you to join with me in thanking Kingdon Ward for a very fine lecture. We hope he may be able to carry out more exploration in that part of the world and that we shall have him back again before very long after another expedition.