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or expert, there are few but will find tedious his method of beginning the divisions of his subject with Adam or the year one.

There is much that is interesting in the compilation. One thing it sadly needs—the office of the pruning-knife. S. E. W.

London.— Sidney Dark. With Illustrations by **Joseph Pennell.** London: Macmillan & Co. 1924. 10½ × 7, pp. xii. + 176. 25*s. net.*

In his introduction, Mr. Dark modestly refers the reason and justification of this work to Mr. Pennell's drawings. These, though hitherto unpublished, were done in 1908. One might have expected, therefore, that many of them would already be records of past glories; fortunately, with one or two obvious exceptions, this is not the case. The artist has chosen his subjects well: so skilfully, indeed, were they picked, and so ably are they executed, that their cumulative effect is to cause one to realize, with perhaps some astonishment, the grandeur that is London. His drawing, happily entitled "Classic London," is particularly striking in composition and outline. Not that he has idealized his subjects; in any case, there is always Mr. Dark at his elbow to paint in his own fashion the realities of London life, repeopling each scene with appropriate historic personages, keeping up a running commentary of literary anecdote and, very occasionally, airing a personal opinion.

Two Vagabonds in the Balkans.— Jan and **Cora Gordon.** London: John Lane. 1925. *Price* 12*s.* 6*d. net.*

In the summer of 1921 Mr. and Mrs. Gordon went to Bosnia on a sketching tour, with the intention of coming into contact with the people rather than of studying the scenery. The actual range of their travels was not great, for they journeyed *viâ* Zagreb to Sarajevo, thence by Mostar to Čapljina, and finally by steamer to Korčula (Curzola). Most of their time was however spent in the country, where they obtained accommodation of varying but generally considerable degrees of squalor and discomfort. Their experiences there give them an insight into the life of simple folk which is denied to the ordinary tourist. The value of the book to the geographer is therefore primarily that it gives a vivid and always good-humoured account of conditions in Bosnia and Herzegovina in the post-war period, an account which brings out all the minor difficulties of re-adjustment, both to changed allegiance and to a changed world. It may be added, however, that it is not necessary to visit the Balkans to find, in present-day Europe, some of the difficulties which the travellers encountered. There are a number of sketches in colour and in black and white, but no index. M. I. N.

ASIA

Tibet Past and Present.— Sir Charles Bell, K.C.I.E., C.M.G. Clarendon Press. 1924. 9 × 5½, pp. xiv. + 326.

Tibet is no longer a land of mystery. Of geographical exploration on a large scale, the most important tasks had been accomplished even prior to the Younghusband Mission of 1904. The history in its main outlines was already known from the researches of scholars, and Col. Waddell's elaborate description of the Lamaist religion had seen the light in 1895. Science has however still much to learn concerning meteorology, ethnology, etc., and the possibilities of industrial and commercial development are still almost a blank page.

The politico-ecclesiastical mystery which once seemed to envelop the country was largely a result of an artificial seclusion dictated by Chinese policy; but it

illustrates the completeness with which Europe has forgotten its own Middle Ages and even the rather recent existence of Papal States. Modern political interest, of which Sir Charles Bell's book is one of the latest fruits, was, of course, a reaction from the Russian advance in Central Asia. But in any case the Government of India, while regulating its relations with the Himalayan states—all alive to the situation in their great Hinterland—would have had to come to some understanding in regard to Tibet.

Sir Charles Bell's service on the Tibetan frontier commenced in 1900: from the time of the Younghusband Mission he was chiefly in political employment. In connection with that mission he led a pioneer party through Bhutan, and subsequently he was almost continuously in charge as political officer of Sikkim and the Chumbi Valley. In the latter capacity he visited the Grand Lama of Tashilhunpo, arranged a treaty with Bhutan, secured the demarcation of the frontier in the wild country further east, and took part in the Simla–Delhi conference of 1913–14 between India, China, and Tibet. The Dalai Lama during his exile in India in 1910–12 was in Sir Charles Bell's political charge and gave him much of his confidence. As author of a grammar and dictionary of colloquial Tibetan, Sir Charles was well acquainted with the language. Accordingly, when in 1920 he was authorized to proceed to Lhasa for the purpose of conferring with the Tibetan authorities, upon their repeated invitation, he was admirably equipped for profiting by the unique experience of nearly a full year's residence in the capital.

Sir Charles has written a very interesting book, unless we prefer to call it a series of chapters. The preliminary sketch of the physical features and the history tell us indeed less than was known before; but even here there are some useful observations, and citations of passages from the literature, proverbial sayings, and so forth. We also learn some new details of the procedure in selecting a Dalai Lama. When we come to the political history of the present century we are presented with much that is not recorded outside Blue Books, along with observations which would hardly be sought in them. In fact, Sir Charles Bell writes with a refreshing candour. He is aware, as the Tibetans also are, of the disadvantage of the British habit of withdrawal, and he recognizes our share of responsibility for trouble brought upon Tibet by fluctuations or abnegation of policy, and the free hand given to China after 1906. With similar frankness he discusses the privileges and aims of Nepal (a serious claimant to influence in Tibet), the growing prestige of Japan in Central Asia, and the probable effect of Indian autonomy upon the policy of the Himalayan States and of Tibet itself.

What the Tibetans desire is a guarantee of their eastern frontier, with China as a party. This they would have secured in 1913–14, but the Chinese disavowed the signature of their representative. The maintenance of a disproportionate army in the threatened districts is a heavy financial burden, and a double source of discontent to the great monasteries, which dislike the displacement of their militia of monks and foresee further encroachments upon their revenues and immunities. Failing a British guarantee, the Tibetans think of making the best terms with the Chinese, whom they dislike as an essentially irreligious people. Only in Buddhist Mongolia, which looks to the Dalai Lama as its Pope, have they a natural, though hardly an effective, ally. Sir Charles Bell was not able to secure for the Tibetans their main object, but he obtained for them permission to import from India annually a modicum of munitions, a limited amount of assistance in training their troops and in engaging mining prospectors, etc., and the establishment of an English

school at Gyantse. The Tibetans on their part agreed to throw open their country to visitors as far as Gyantse. The future of the country, whether we consider the internal or the external factors, is wholly problematic.

The personal sketches in Sir Charles Bell's work are invaluable. He has enjoyed the confidence which his sincere and sympathetic attitude deserved. He exhibits the Tibetan leaders as real individuals confronted by difficulties which they comprehend and taking candid note of the limitations upon the action of those with whom they have to deal. It is to be hoped that their frankness may not be despised by more sophisticated politicians.

The dominant personality is, of course, the Dalai Lama himself. His exalted spiritual titles and the vicissitudes of his career seem to have left him with a good deal of human nature. In both a religious and a temporal capacity he discharges an incredible amount of detailed business. Subordination of the political to the ecclesiastical power is in accordance with the sentiment of the Tibetans (logically enough, since they believe in their religion !), and an anecdote on p. 141 illustrates the effect with which the Dalai Lama can appeal to his status as a reincarnation of his predecessors and the original source of any privileges which he may find it necessary to revoke.

The last two chapters of the book are devoted to the main lines of British policy and some suggestions in detail. Both chapters deserve careful perusal. It is curious to observe that on the eastern frontier the Christian missionaries are credited with a strongly anti-Buddhist sentiment and with pro-Chinese influence.

In an appendix Sir Charles Bell gives the text of the most important modern treaties and agreements relating to Tibet, along with a revised translation of three Tibetan stone records of treaties, two of them being among the 'Ancient Historical Edicts at Lhasa,' published with translations by Col. Waddell in 1909–11. Some of the photographs in the book are highly interesting, and it is satisfactorily furnished with index and maps.

We would record an emphatic protest against Sir Charles Bell's method of writing Tibetan words. There are only two reasonable ways of representing languages which have a script, namely by phonetic writing or by exact transliteration. The former may be applied to old Asiatic literary languages when we apply it to our own. If we transliterate exactly, we can indicate the rules of pronunciation with little more explanation than is required for the amateur who attempts to write the language as it is spoken. Sir Charles Bell aims at conveying a "Mandarin" pronunciation (which is one of several dialects), and he applies this even to titles of books and persons much older than such pronunciation. To write *Chö-chung* for *Chos-hbyogoin*, *Chenrezi* for *Spyan-ras-gzigo*, *Gye-rap Sal-we Me-long* for *Rgyal-rabs-gsal-bahi-me-lon*, *ke* for *khal*, is to do violence to history, philology, consistency, and significance, and it is hardly respectful to a literary language more ancient and not so very much more unphonetically written than English itself.

F. W. T.

The Vanished Cities of Arabia.— Mrs. Steuart Erskine. London : Hutchinson & Co. [1925.] $9\frac{1}{2} \times 6$. Pp. 324. 40 *Illustrations* (5 *coloured*) *by Major Benton Fletcher*. 25*s. net.*

In the *Geographical Journal*, December 1924, p. 486, we reviewed Mrs. Erskine's book of travel 'Trans-Jordan,' where she gives a pleasing sketch of her visit to the same places as are described in much more detail in this more ambitious volume. The title used is not in our opinion a happy one ; the

THE DE FILIPPI EXPEDITION TO THE HIMALAYA

Storia della Spedizione Scientifica Italiana nel Himàlaia Caracorùm e Turchestàn Cinese (1913-1914).— F. de Filippi. Bologna: Nicola Zanichelli. [1924.] 10½ × 8, pp. xiii. + 541. *Illustrations* (2 *coloured*, 29 *full-page*, 288 *in text*), 9 *Panoramas and* 3 *Maps in pocket. Lire* 200.

THE discovery in 1909 of the unsuspected extent of the Siachen glacier system served to draw attention to our lack of any precise knowledge concerning the adjacent basin of the Rimu, as also of the sources of the Yarkand river, and of the mutual relations of both with the still more mysterious valley of the Oprang, into which only Younghusband had forced a difficult entry. It was to the solution of these several problems that our Gold Medallist, the author of the present volume, addressed himself in 1913. Had it not been for the outbreak of the Great War there can be little doubt, amongst those who know his record, that his success would have been as complete as that which has invariably attended the remarkable series of recent Italian expeditions in which he has played so prominent a part. His solution of the first two of these problems is complete and final; but though the outer confines of the Oprang have been accurately laid down—a very great safeguard to its future explorers—the expedition had to go home before the main valley itself could be explored.

The Italian expedition of 1913-1914 seems to the reviewer to open out almost a new chapter in the history of mountain exploration. De Filippi set himself not merely the problem of exploring, as only a mountaineer could do, these unknown glaciers and baffling mazes of mountains, but also the vast task of making a complete survey in all the sciences of the whole extent of country to be traversed. Investigations in ethnology, meteorology, geology, terrestrial magnetism, gravity, indeed all the problems of physical geography in its widest sense, were regarded as equally principal objects of an exploring expedition. Surely no expedition has ever entered High Asia, or any other mountain region, with such an equipment of scientific instruments, or with such a band of skilled observers. The names of Alessio, Abetti, Dainelli, Alessandri, and Antilli, with Ginori, Spranger, and Wood with his Indian Survey party, including Jamna Prasad and Shib Lal, and last but not least the veteran guide Petigax, are a sufficient indication of the quality of the work done. Their scientific results are being published in the beautiful series of 'Relazioni Scientifiche della Spedizione Italiana de Filippi nell' Himalaia, Caracoram e Turchestan Cinese (1913-1914)' by Zanichelli of Bologna, and their extent and importance can in no way be realized by a perusal of the narrative of the expedition now before us, which is intended mainly for the general reader.* But the general reader has never had a travel book better got up nor so lavishly illustrated, and it is a volume which will be found of engrossing interest by every one concerned with any aspect of Himalayan problems. Even through the earlier chapters, which deal with comparatively well-known ground, the author succeeds in holding our attention. He has the rare faculty of effacing himself and giving us instead the personality of the place he is describing. In Srinagar our time is spent with Mogul Emperors rather than with the men and means employed to organize victory for the expedition by such care and forethought in preparation as can only be appreciated by those who have travelled under similar conditions of season and country. Even

* The glaciological volume was reviewed in the *Journal*, vol. **63**, p. 243. Two volumes on the peoples of the tract explored have also appeared.

apart from the exceptionally fine illustrations, the chapters on Baltistan and Ladak are of unusual interest, for, in order to place their various researches on a sound basis, the expedition wintered there, and this first account of winter conditions adds much to our understanding of the conditions of the life and occupations of the inhabitants. The remarkable mixture of Moslem and Buddhist elements, in the past as in the present history of Baltistan and Ladak, is well brought out. The photographs of Buddhist architecture, painting, and sculpture in chapter vi. are especially noteworthy. Desideri gave us the first account of Leh, and now two centuries later his compatriots give us a description such as has not been excelled in the mean time.

Chapters v., viii., and ix., contributed by Professor Dainelli, describe summer and winter conditions over the greater part of Baltistan and Ladak, from Skardu and Shigar to the Tso Moriri and Pangong, with their patchwork pattern of intermingled population ranging from so-called Dards to pure Tibetans.

We are introduced to the rigorous pleasures of caravan travelling by the frontispiece, a very beautiful and absolutely true painting of the view looking back down the upper Shayok. There the travellers entered uninhabited country and saw no cultivation for the next five months. It is in fact a region entirely destitute of supplies: even the scanty grazing of the side glens is left behind before reaching the lofty plateau of Depsang, where *argol* must replace the last woody roots of *burtse* as fuel, and which was destined to be for several bleak weeks the headquarters of the expedition, at a height of nearly 18,000 feet above sea-level. Mountaineers will examine with interest the plate opposite p. 312 showing the uncompromising eastern side of the 25,000-foot range between the Shayok and the Nubra, and will conclude to follow previous attempts from the west.

The actual exploration of new ground commenced on reaching the Rimu glacier. The author's spelling of this name of doubtful origin might well be universally adopted, for it exactly reproduces the sound of the vernaculars, while Remo does not. It is interesting to note in the illustrations a development of ice-pinnacles comparable to that found on the north side of Mount Everest, indicating that the respective climatic conditions approach each other much more nearly here than on the southern and western aspects of the Karakoram or Muztagh ranges. It will be noted that the snouts of all the great Karakoram glaciers terminate successively at a higher and higher altitude as we proceed from west to east: this is probably due rather to increased evaporation than to decreased precipitation.

By an admirable division of forces the whole of this great glacier system was explored and surveyed—for the first time and with final thoroughness. The value of the text illustrations and panoramas is greatly enhanced by a map on the scale of 1/100,000, which, with two other maps and the panoramas, is conveniently placed loose in a portfolio at the end of the volume.

The Rimu glacier was proved to be the one true source of the Shayok river —as had been suspected; but it remained for the Italians and their English colleague to make the totally unexpected discovery that the Yarkand river itself takes its ultimate source from the same glacier. The north-western arm of the Rimu glacier, shortly before its junction with the main ice stream, abuts against the water-parting and thrusts an elbow actually over the main axis of the Karakoram, towards the north-east; from this overlapping tongue the Yarkand river rises. Thus the waters flowing to such diverse destinations as the Indian Ocean and the dead salt beds of Lop Nor are separated only by an

almost invisible rise on a level glacier surface. Wood and Spranger, working up the Yarkand river from the north, first found this overflow from the ice-reservoirs of the Rimu (as described by Spranger in chapter xiii.), and three days later De Filippi, leading a party up the Rimu glacier itself, reached the same spot from the south. There is strong evidence, amounting to a practical certainty, that the head source of the Oprang river itself lies only 5 miles to the north-west of this spot, that is 30 miles further to the east than was hypothetically shown on the old map.

The previously recorded evidence concerning the lost routes from the Yarkand river to Baltistan and Nubra is carefully set out. All the way through the book the author displays a very complete knowledge and a just appreciation of the work of previous travellers, thereby giving an added interest to his own narrative. He manages to give criticism in the form of impersonal additions to our knowledge rather than in the key of personal correction, a method which might well be, but is not, adopted by all travellers. He even goes to the length of quoting in full from our *Journal* a mere forecast of the topography (*Geog. Journ.*, 35, pp. 652–3), confirming it in a generous sentence. How different is such a chivalrous spirit from that animating the other type of explorer, who may ultimately find himself remembered as much because of the way he belittles his predecessors as on account of the good work he may have accomplished himself!

Wood and Spranger, whilst working out the different headstreams of the Yarkand river, found indubitable traces of native travellers, and there can be no doubt that, in addition to Younghusband's Aghil pass, other routes were formerly in occasional use which led from above Khapalun (= Khufelang of English maps) on the Yarkand river, over into the head of the Oprang valley and thence across the lofty main axis of the Karakoram chain on to the upper Siachen glacier: here the routes would again divide, one leading directly down this glacier to Nubra and Ladak and the other over a side pass into the Saltoro valley, and so to Khapalu in Baltistan. This is the most intriguing Himalayan secret that remains to be worked out—though we must not be surprised to learn that it has been solved this year by Visser and his intrepid wife, who are credited with the intention of entering the Oprang valley from the Hunza side. English readers may like to consult Wood's most interesting report to the Survey of India.*

On August 16 the party, temporarily united again at their base camp on the Depsang plateau, received the first news of the outbreak of the Great War. The Italian officers, Alessio, Antilli, and Alessandri, decided to return home immediately, and in twenty-three days they were in Bombay!—a pretty good travelling record. Wood being enabled by his orders to remain, replaced Alessio as second in command. The author records his appreciation of the action of the Indian authorities in allowing Wood to remain and in permitting the continuation of the radio time-signals from Lahore and the complementary meteorological observations at Dehra Dun, despite the grave preoccupations of this crisis. It is an indication of the great physical difficulties surmounted by the expedition that they did not learn definitely that England was at war until they reached Yarkand in October. This catastrophe, though it ultimately shattered the original scheme of the expedition, was not allowed to divert them

* 'Explorations in the Eastern Karakoram and the Upper Yarkand Valley. Narrative report of the Survey of India Detachment with the De Filippi Expedition, 1914.' Dehra Dun: printed at the Office of the Trigonometrical Survey of India. 1922. 6*s*.

from anything that was still possible. The only practicable way, for such a large party with such heavy impedimenta, to work beyond the Karakoram pass was to enlist Kirghiz camel transport from Shahidula. Their caravan-bashi Ghulam Rasul, none other than our old friend the author of that delightful book 'A Servant of Sahibs,' carried out the delicate operation of changing transport in the middle of a desert, and the expedition crossed the Karakoram pass and the Sughet Dawan. At Sughet a gravity station was established and most of the heavy impedimenta were temporarily deposited, while the expedition split up for work in different directions and Dainelli and Marinelli left for Italy *viâ* Kashgar. It was only through a very carefully devised scheme of division of forces that such an enormous amount of work was accomplished in one season, interrupted as it was by prolonged spells of bad weather: we read constantly of clouds interfering with work and of a snowstorm lasting seventy-two hours. During September De Filippi, with Ginori and Abetti, followed the Yarkand river to below Bazar Dara in an attempt to penetrate to the Oprang Valley by the Aghil pass; but heavy rains rendered the Raskam river impassable, and they had to return disappointed, crossing the rarely used Takta-Koram pass to Khargalik. Here their survey of 5000 square miles was closed and another gravity station established; indeed, pendulum observations were carried out at suitable stations right through to the Russian Observatory at Tashkent, where all the heavy apparatus still lies. A return to Europe was now inevitable, and, passing through Yarkand and Kashgar, the last of the party, having crossed the Terek Dawan in the snows of November, reached the railway at Andijan. From Tashkent they slowly made their way, through the dislocation of the war, to Odessa and through the Balkans to Italy.

With an uncommon economy of words, yet with no apparent effort of compression, the author—aided by his collaborators with pen and camera—succeeds in giving in short compass a delightful account of a very long journey, during which he never allows his readers' interest to flag for a single page, for he never fails to bring reality before them. It is much to be desired that a translation of this remarkable book should be available for English readers.

T. G. L.

IMPERIAL STOCKTAKING

The British Empire. A Survey in Twelve Volumes. General Editor, **Hugh Gunn.** London: W. Collins Sons & Co., Ltd. 1924. 9 × 6. 16*s. net each volume.*

(2) The Story of the Empire. Sir Charles Lucas. (4) The Resources of the Empire and Their Development. Evans Lewin. (6) The Press and Communications of the Empire. J. Saxon Mills. (8) Makers of the Empire. Hugh Gunn. (9) The Native Races of the Empire. Sir Godfrey Lagden.*

THE series to which these five volumes belong was published as a part of the educational work of the British Empire Exhibition, and was planned to give "a complete survey of the history, resources, and activities of the Empire looked at as a whole." The editors have been fortunate in securing the assistance of many persons prominent in the public life and administration of the Empire possessing a personal knowledge of the subjects of which they write, so that the series, although prepared primarily for the general reader, has also a special historical value and authority on this account.

* For review of this volume see *Journal*, **65**, p. 455.

particular the interest which would attach to an archæological investigation of South-East Africa.

Before his retirement in 1899 O'Neill had occupied the post of Consul first at Leghorn, afterwards at Rouen, making an interesting study of the fluvial traffic of the latter port and the part played by the internal waterways in the development of French trade. The results were published in a valuable report issued by the Foreign Office in 1895. In his latter years he made his home firstly at Heathfield in Sussex and afterwards at Matlock.

Dr. Charles Forbes Harford.

It is with special regret that we record the death of Dr. C. F. Harford, which occurred suddenly on July 4, since he had long been closely associated with the work of the Society, as editor of its 'Hints on Outfit' and referee on matters connected with the hygiene of Travel.

Dr. Harford was the youngest son of the late Canon Harford-Battersby of Keswick, having dropped the second half of the name in later life. Educated at Repton and Trinity, Cambridge, he chose the career of medicine, and in 1890 became Medical Missionary in Nigeria under the C.M.S., with which body he continued to maintain close relations after his return to this country in 1892. In 1893 he joined with others in the founding of Livingstone College, designed to provide intending missionaries with instruction in the rules of health and the special dangers of tropical climates; and he became its first Principal. During his tenure of the office he organized a "Livingstone Exhibition" of travellers' equipments and health requisites at the St. Martin's Town Hall, which was on view, and illustrated by lectures, in January 1900. He continued to maintain a keen interest in and sympathy with Nigeria and its peoples, and for a time he edited a serial devoted to the subject under the title *Niger and Yoruba Notes*. He was also for some years Honorary Secretary, and eventually Chairman of Executive, of the Native Races and Liquor Traffic United Committee. With a view to improving the popular knowledge of Tropical Hygiene he edited a journal bearing the title *Climate: a Quarterly Journal of Health and Travel*, of which five volumes were issued between 1899 and 1905; and as joint Secretary of the Society of Tropical Medicine and Hygiene from 1908 to 1917 he did further valuable work in the same direction. Besides the publications already mentioned he was the author of a life of 'Pilkington of Uganda,' dealing with an important episode in the history of the C.M.S. Mission in that country.

CORRESPONDENCE

The Spelling of Tibetan.

IN the very interesting review of Sir Charles Bell's 'Tibet Past and Present,' which appears in your July *Journal*, the reviewer in his last paragraph makes some rather severe strictures upon Sir Charles Bell's method of writing Tibetan words. I venture, with great diffidence, to submit some observations on your reviewer's remarks in this connection.

He will, I am sure, excuse me when I say that he is, in my opinion, guilty of some exaggeration when he says (for instance) that Tibetan is "not so very much more unphonetically written than English itself." English, it may

be admitted, is bad enough in this respect; but Tibetan is many times worse—as will be seen from your reviewer's own version of certain Tibetan words. To attempt to *transliterate* Tibetan, in fact (and this can only be done with the aid of certain more or less arbitrary diacritical marks), is to produce a repellant-looking and utterly unpronounceable collocation of letters, quite useless as a guide to the spoken words (except to Tibetan scholars, and useless even to them unless they have also studied the vernacular), which no one would dream of using for such practical purposes as a map, or a popular work on Tibet such as Sir Charles Bell's.

Your reviewer, however, says that "if we transliterate exactly, we can indicate the rules of pronunciation with little more explanation than is required for the amateur who attempts to write the language as it is spoken."

Can we indeed do so? When I was placed on special duty during the preparatory period before the Mission to Lhasa in 1904, this was one of the very first matters which attracted my attention, and I prepared a memorandum of proposed "Rules for the Phonetic Transcription into English of Tibetan words" (of which I enclose a copy). I quote the introductory paragraph:

"The Tibetan system of spelling is so peculiar and so complicated that a mere transliteration of a given word into English characters gives no idea whatever of the correct pronunciation. This fact probably accounts in a great measure for the wide divergences to be found in the spelling of place-names in existing maps of Tibet. Scarcely any two maps will be found to correspond; and in some cases the differences are so great as to render the identification of a particular place in two separate maps almost impossible. This grave inconvenience may be obviated, at any rate in maps published officially, by the adoption of a simple system of transcription, based on the recognized rules of Tibetan orthography, which will produce a word in English characters of the approximately correct sound. It is impossible to reproduce the *exact* Tibetan pronunciation in Roman characters; the Tibetan language has tones and shades of expression peculiar to itself which can be learnt only by oral instruction. It is merely misleading to attempt to reproduce them in any European system of spelling."

As you will observe, it takes six printed pages to cover every case of transcription, and to give an even approximately correct phonetic spelling for every syllable. It is, therefore, scarcely the simple matter indicated by your reviewer.

No. Emphatically Sir Charles Bell is right in making use of a simplified form of transcription in a popular work. He could no doubt have given the exact scientific transliteration in footnotes, but in a book of this nature it would have been rather pedantic to do so. I may add that he has used this simplified form of spelling also in his admirable Tibetan Grammar—a work for which all students of the spoken language owe him a debt of gratitude.

I need scarcely add that for strictly scientific works the strictly scientific method of transliteration should of course be adhered to.

W. F. O'CONNOR, Lieut.-Col.

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OBSERVATIONS ON THE ROCKS AND GLACIERS OF MOUNT EVEREST

N. E. Odell, A.R.S.M., F.G.S.

Read at the Afternoon Meeting of the Society, 18 *May* 1925. *Map follows p.* 384.

IN April 1922 Dr. Heron read to this Society an admirable paper (*Geo. Jour.*, vol. 59, No. 6), on the geological results of the first Expedition that he accompanied as official geologist. That paper gave an outline of his strenuous activities in the area lying to the north of Mount Everest, and his work was, as he himself has said, "virtually a continuation to the westward of Sir Henry Hayden's pioneer investigations during the Tibet Expedition of 1903–4." Heron's work was largely concerned with the sedimentary rocks that comprise the area to the north of the great belt of crystalline rocks developed along the main axis of the Himalaya. Time did not permit of his making more than brief flying visits, so to speak, to the crystalline zone, and he had hoped, on the next expedition, to study the crystalline area in detail. However, in 1922 and again in 1924 political objections were raised to the presence of an officer of the Geological Survey of India, and so the opportunity of much valuable work on the great problems of the uplift of the Himalayas, in a region hitherto inaccessible, had to be sacrificed. I was merely a member of the climbing party and oxygen officer. But it could hardly be expected that a geologist by profession, however occupied with the numerous other duties appertaining to the expedition, would keep his eyes closed to all the features of the landscape for the five months during which the expedition lasted. And it is the results of those observations and a few of the conclusions drawn therefrom that I propose to put before you. The paucity of the results I am only too well aware of, but preoccupation with the oxygen apparatus for use on the mountain, which necessitated continual work on it during the whole of the outward journey, as well as the time spent in the attempts on the summit, and all that this primary object of the expedition involved, quite prevented much detailed observation.

PART I. THE ROCKS.

I propose at the outset to skip over any observations I may have to record on the younger sedimentary rocks, of which the vast elevated plateau of Tibet is predominantly formed. I have scarcely anything to add to the work of Sir Henry Hayden and Dr. Heron on these formamations. My observations are principally confined to the crystalline and metamorphic zone of the main chain of the Himalayas and their associated rocks, the so-called "Metamorphic Complex," and may be considered as supplementary to those made by Dr. Heron more especially up to the northern border of this zone. I was able to penetrate well into this zone in two localities in particular, that in the neighbourhood of Mount Everest itself, and that of the Rongshar and Gaurisankar about 40 miles to the west. But in neither case had I the opportunity of extending my investigations very far laterally, that is to say, east and west of these southward lines.

The Mount Everest Region.

In trekking southward from the town of Shekar Dzong *en route* to Mount Everest, the crystalline rocks first make their appearance in the valley of the Dzakar Chu at the point where the Gyachung Chu comes in from the west. The path to Rongbuk leads along on the true right bank of the Dzakar Chu, and apart from an interesting occurrence above the Chöbu monastery recorded by Heron, one first strikes the main mass of the crystallines at the above river junction in a great cliff overlooking it on the eastern side. It is composed of dark horizontally banded biotite gneiss alternating with bands of light granite, though in the upper part of the cliff the latter is represented by pegmatite, and the whole appears to represent a large-scale example of "lit-par-lit" injection. The section showed a predominance of gneiss towards the top of the cliff. The gneiss itself shows an alternation of biotitic and felspathic bands, and this strongly foliated type is essentially non-porphyritic. The important question of the relation of this crystalline mass to the limestones that rest on it near the summit of the bluff will be dealt with later.

As one proceeds up the wide valley of the upper Dzakar Chu past the village of Rongbuk this same strikingly banded series continues on either side, often forming steep cliffs, especially on the east side of the valley, with inevitable talus slopes at their foot. Near Za-Rongbuk is a section close to the path showing clearly the biotite gneiss invaded and cut clean across by bands of pegmatite, indicating the younger age of the latter.

A far-flung head-tributary of the Dzakar Chu enters the main valley from the east not far from the snout of the Rongbuk Glacier, and here in the gorge it has excavated I found a most interesting section through the banded gneiss and its associated rocks. Persisting in its horizontality for the most part, the former was again seen to be intimately mixed up with the light granite, which invaded it both along the planes of foliation

and also right across them. This granite was pinkish in colour, contained tourmaline and garnet, and being poor in white mica frequently graded off into pegmatite. The biotite gneiss also was here notably garnetiferous. Isolated lenticles of the pegmatite within the gneiss were sometimes apparent, and that the whole had been reduced to a state of fluxion at some time in its history was evidenced by veinlets of the biotitic rock running off into the pegmatite. The gneiss on the whole had only local contortions, but at one point in the gorge a fault block had been turned through 90°. Higher up in the gorge occurred a very coarse porphyritic granite or pegmatite with large phenocrysts of muscovite and tourmaline, often 2 or 3 inches across. Resting on the latter was a large mass of hard green variegated limestone, thoroughly crystalline, containing much epidote where the pegmatite had invaded it. The relation of these limestones to the overlying gneisses was unfortunately obscured by slopes of scree. In this gorge, which I tentatively dubbed the "Hermit's Gorge," owing to the existence of a lama's retreat near its entrance, I was also interested to find pebbles of grey limestone, evidently washed down from the parent bed (Permo-Trias) away to the east, but time did not admit of my ascertaining this.

Another locality that was examined in some detail was the steep face overlooking Camp I. on the north by the snout of the East Rongbuk Glacier. Here was again found thoroughly metamorphosed and crystalline limestone resting on the schorl granite, which sent off apophyses into it. Above the limestone, which had perhaps an apparent thickness of about 100 feet, was the banded biotite gneiss associated with other metamorphic rocks appearing conformable upon the limestone, and looking more than ever like a bedded sedimentary series.

The same succession extends southward to the head of the East Rongbuk Glacier, giving the impression of a practically undisturbed stratified series. Near Camp III. an exposure at the end of the eastern spur of Changtse showed the same metamorphic series, though without the limestone, garnetiferous biotite schist being predominant, and the whole mass permeated with pegmatite. Southward across the névé basin of the East Rongbuk Glacier the series appears to continue in the lower part of the north-east ridge of Mount Everest itself, and the marked junction it makes with the overlying banded biotite gneiss is nowhere better seen perhaps than from Camp III., though bad weather and snow-covered rocks prevented my examining this junction in detail. A noted fault and anticlinal flexure of the beds is seen also from here.

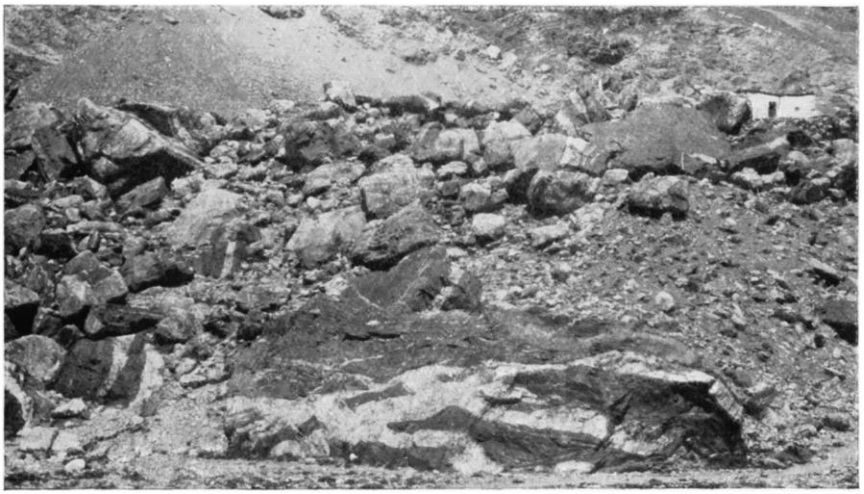
The rocks of the North Col vary from dark very fine-grained biotite gneisses to hornblende and tourmaline rocks, dipping northward at 29° to 30°. As one proceeds up the north ridge of Mount Everest the rocks change from the more silicious varieties found below to others decidedly calcareous in composition. At about 24,000 feet there was some slight evidence of an unconformable junction between the silicious

and calcareous facies, but owing to the rolling of the beds and the general dip outwards (*i.e.* north) of approximately 30°, the gradient of the ridge itself being here about 35° to 40°, together with the extensive screes, it was impossible to determine this precisely. It is of course this particular characteristic of the north face of Mount Everest, namely, the outward sloping overlapping slabs with their numerous "reversed scarp" faces, that makes the ascent so awkward, though not strictly difficult. The rocks moreover are not on the whole rotten, since they have been considerably indurated.

I do not propose here to describe in detail all the petrographical types met with in the upper part of the mountain: suffice it to say that they consist predominantly of dark calc gneisses, light limestones, and sandstones. Specimens brought back in 1922 by the high-climbing parties and examined by Dr. Heron, were diagnosed by him to be calc-silicate rocks for the most part, but unfortunately he was led badly astray in regard to one important zone. I refer to the light brown band of rock that extends so prominently from the north-east shoulder right along into the base of the final pyramid. Geologists should be the last people to depreciate assistance rendered by amateurs. Nevertheless the latter are apt to lead one astray in such matters as the exact localities at which material has been collected, and especially in regard to the predominance, or fortuitous occurrence, of any specimens collected. The party that reached the above light band of rock in 1922, brought back a specimen from it that Heron examined and found to be a schorl moscovite granite. I reached this belt of rock myself last year and found it to be undoubtedly formed of calcareous sandstone, which incidentally is at times micaceous. Now the whole metamorphic series of which Mount Everest is composed is intruded by the light schorl granite and pegmatite, which breaks across the bedded rocks in conspicuous dykes and veins here and there, having come up through the subjacent biotite gneiss. This intrusive granitoid rock is very insignificant in amount relatively to the sediments, and occurs quite fortuitously. The simple explanation of the anomalous find of 1922 is that if it were definitely made at this light belt of rock at over 27,000 feet, it was plucked from a chance occurrence of the granitoid rock within the sandstone. Consequently, I fear the view expressed by Dr. Heron that this supposed sill of hard granite is the main factor in preserving the prominent north-east shoulder, as well presumably as the main peak, is no longer valid.

The final pyramid of the mountain is composed of a dark calc schist containing quartz and biotite, very fine grained and compact, which extends also some distance along the north-east shoulder as a cap rock to the above-mentioned sandstone, and this may in some degree be contributory to the pre-eminence of Mount Everest. But, in my opinion, other and more cogent factors, causes predominantly tectonic, must be

WEATHERED STACK OF BANDED GNEISS AND GRANITE, ALSO OLD MORAINE TERRACES ON FURTHER SIDE: RONGBUK VALLEY



DARK BIOTITE GNEISS WITH INTRUSIVE VEINS OF WHITE PEGMATITE: ZA·RONGBUK

BANDED GNEISS (DARK) AND GRANITE (LIGHT) RONGBUK VALLEY

BIOTITE GNEISSES RESTING ON LOWER CALCAREOUS SERIES (LIGHT): CAMP I.

CLIFFS OF THE NORTH-EAST SHOULDER OF MOUNT EVEREST, SHOWING DISLOCATION AND FLEXURE OF BEDDED BIOTITE SERIES

sought for a full explanation of this pre-eminence. The extra height of the final pyramid, however, would appear to be due to a fault of small throw bounding its eastern side, the line of which marks the pronounced couloir that was reached by Norton on the occasion of his recent ascent.

Looking from high up on the north face of Mount Everest, I had the opportunity in intervals of good weather—which when I was there were all too infrequent—to observe the continuation of the Everest sedimentary series northward in the North Peak (Changtse). The upper part of the latter is obviously composed of the Everest calcareous series, resting on the bedded biotite gneiss, profusely veined with the light pegmatites. The junction of the two series is most marked, owing to the colour difference, and is straight and regular. This is vividly shown in Somervell's wonderful photograph taken from 28,000 feet, where one is looking down the dip-slope of the series. The true nature of this important junction it is difficult to tell, but it has the appearance of being a disconformable one, though one is apt to be deceived by the foliation as well as by the irregular veins and sills of pegmatite, which however are mostly confined to the dark gneiss below. The further extent of the upper calcareous series is seen in the upper parts of the higher peaks, such as Khartaphu to the north-east, and probably Gyachung Kang to the north-west; but the lower peaks are mostly of the lower biotite series, the prominence of many, no doubt, being partly due to their being fortified by the intrusive granites and pegmatites.

The marked extension almost horizontally of the west ridge of Mount Everest itself is due similarly to its being composed of the more resistant biotite gneisses, the softer overlying calcareous rocks having been here eroded away.

In the region of the West Rongbuk Glacier, which was visited by Hazard to extend the topographical survey, I understand there are representatives of most of the afore-mentioned metamorphic rocks, and these are in their expected positions relative to one another.

The Rongshar Region.

The Kyebrak glacier, which flows northward between the lofty Cho Uyo and Cho Rapsang, occupies a valley which in its lower part is bordered by cliffs of the same series of banded biotite gneisses as exist in the Rongbuk valley. Beneath these I found at several places the same metamorphosed sediments, in particular limestone, as obtained below the banded gneisses of the Rongbuk. These series were all well veined with pegmatites. In the neighbourhood of the Phusi La, that leads over into the Rongshar Valley at an altitude of just over 17,000 feet, I found umistakable representatives of the upper Everest calc gneisses. These I first identified in the northern spurs of Pt. 18620, which is a northern outlier of Cho Rapsang, and saw that they also extended all

along the top of the range bordering the west side of the Kyebrak glacier, both north and south of the Phusi La. I also found cliffs of limestone and calc-gneiss well over on the southern side of the pass. These were succeeded below, as was to be expected, by the banded biotite gneiss series. In dropping down the upper part of the Rongshar, my notes record a gradual change from the horizontally banded and foliated gneiss of the northern side of the range to the much more knotted and contorted gneiss that extended throughout the lower parts of the gorge. This latter gneiss was recognizable of course as the typical Himalayan "Augen Gneiss" that forms the core of the whole extent of the range, and which has been so often described from numerous localities. It is almost unnecessary for me to repeat here that its truly intrusive character was long ago proved by the late Gen. C. A. McMahon.* Both in texture and structure the contrast between this augen gneiss and the intensely foliated biotite gneiss could hardly be greater, though I cannot here go into the essential points of difference

The junction and relationship of the two in the upper Rongshar I was unable to determine with any precision, either owing to inaccessibility or the obstruction of talus and moraine, but it would certainly appear that the augen variety were the younger and intrusive facies. I might mention that Heron, from what he saw in the Kharta valley and elsewhere, was obliged to leave the question of relationship undetermined. In the lower Rongshar the general dip of the augen gneiss appeared to be from 25° to 30° North, and this persisted right into Nepalese territory. Near Tasang and lower down at Chuphar appeared schists and other metamorphic rocks, including limestones—one more link, can we say, in the chain of evidence for an ancient sedimentary series, that may represent, as Hayden and others have supposed, a distant "inlier" of one or other of the Archean systems of the Indian Peninsula. Throughout the Rongshar region the typical schorl granite was again seen with its associated pegmatite, cutting across everything and exhibiting in places such extreme fluidity that parts of the gneiss into which it had been intruded were floated off during its injection.

Prof. Garwood, during his classic journey with Dr. Freshfield round Kangchenjunga,† was not able to find definite evidence that the pegmatites of that region were younger in age than the Himalayan gneiss, but thought that the former might be apophyses of the gneiss. In the Rongshar to the west, at any rate, the relation is unmistakable; that the pegmatites are the younger, though probably not by very much, since at places broad bands of pegmatite lie "bedded" almost horizontally with the augen gneiss, and give the appearance of having been rolled out with the gneiss during movements subsequent to the latest intrusions.

* *Records of the Geol. Survey of India*, vol. 15 (1882), p. 44; vol. 16 (1883), p. 129; and *Geological Magazine*, Decade iii., vol. 4 (1887), p. 215.

† Garwood in Round Kangchenjunga,' D. W. Freshfield p. 292.

As to the structure of Gaurisankar itself, I was never able to see it sufficiently clear of cloud or snow to be able to make out the nature of its upper part, but its lower rocks appeared to be of typical Himalayan ortho-gneiss much fortified with pegmatite dykes.

Permo-Trias Limestones.

Before attempting to base any conclusions upon the similar metamorphic suites of rocks of the two districts visited and described above, I propose to deal briefly with the series of limestones that Dr. Heron found running along the southern border of the vast extent of Jurassic shales of the Tibetan Plateau, and which are wedged in at places between these folded shales and the metamorphic rocks of the crystalline complex. These were found by Heron to be a uniform assemblage of unfossiliferous limestones with shaley partings, all fossils having been destroyed and now appearing supposedly as streaks of crystalline calcite. But in one locality a prolific fossil fauna of Productus and Spirifer was found, indicating a probable Upper Permian age for the limestones. The Jurassic shales appeared to be lying conformably on these limestones. Now Hayden was of opinion, from his researches in the country to the east, that the Jurassic shales represent the upper part only of that system and are the equivalents of the Spiti Shales, and that the lower (Lias) beds, as evidenced around Phari in particular, consist of various slates, quartzites, and limestones, the lowest of all being a brachiopod limestone, whose fauna indicated either Liassic or possibly Rhaetic age.

Professor Garwood found an interesting crinoid limestone in Lhonak on the northern border of Sikkim, which in spite of earlier faunistic difficulties Hayden has shown to be very probably Jurassic; these difficulties, incidentally, were on account of its apparent equivalence to the crinoidal limestone found by Sir Joseph Hooker on the north-eastern border of Sikkim, and thought by him to contain nummulites and to be therefore Tertiary in age.

But Hayden has shown the fallacy of this, and the extreme probability of its also being Jurassic and in particular Liassic. All these fossiliferous limestones along the northern border of Sikkim appear therefore to be coæval, and it is not until we get into the region of the Dzakar Chu to the west, where Heron found his Permian or Lower Trias limestone in a corresponding position with regard to the crystalline rocks, that difficulties of correlation arise. Briefly, it would appear that if the Upper Jurassic (Spiti) shales are resting upon the productus limestone, then a large series of rocks, referred by Hayden to the Oolite and Lias stages, has been cut out, although Heron at this point says the shales seem to rest normally on the limestones. The point is of interest, since to the west of the Dzakar Chu and extending much further west beyond the Lamna La, I found a large series of limestones overlapping on to the crystallines to the south and brought up against the shales on the northern

side. These hard, dark grey limestones, weathering reddish-brown, were quite unfossiliferous and seamed throughout with calcite. Owing to their lithological resemblance and position, I took them at once to be the westward extension along the strike of Heron's Permo-Trias series, though in this locality he had mapped the occurrence of Jurassic only. Looking east across the Dzakar Chu one could make out by colour contrast their certain continuation into the area actually mapped as Permo-Trias. Now associated with these limestones near the Lamna La I found ferruginous quartzite, conglomerate, and the ever ubiquitous shales, and it would seem that the association of these zones with the limestone would place the series on a par with Hayden's succession for the Jurassic in the Kampa and Phari regions, or at any rate with a good part of that succession. Certain beds of the succession of Lamna La seem to be missing, but there is considerable evidence of strike faulting which would explain this. While the limestone series here is so completely barren of fauna and calcitized and cannot be compared with the highly fossiliferous beds near Kampa, yet the character of the former may be entirely due to its proximity to the hard crystalline rocks and its alteration brought about by pressure against them, if not also by their igneous intrusives. At the same time it is equally possible that the same strike faulting and probable overthrusting, along the line of the Dzakar Chu and Lamna La may have cut out some of the limestone and other zones of the Lower Jurassic, and have caused the Permo-Trias limestone, continued westward beyond the Lamna La, to be thrown against the Upper Jurassic shales. On two occasions, once by a flooded river and another time by a feeble pony, I was prevented from reaching Heron's type areas of the Permo-Trias limestone and so comparing their stratigraphical relationship and character with those of the limestones I found east and west of the Lamna La.

But whether this limestone be referred to the Permo-Trias or to the Jurassic System, I noticed that it appeared to be strikingly unconformable to the banded biotite gneisses of the Metamorphic Complex on to which it transgressed. At the top of the cliff overlooking the confluence of the Dzakar Chu and the Gyachung Chu mentioned earlier, it was seen that the limestone seemed to transgress the bedded biotite gneiss, but the flooded state of the river unfortunately prevented my crossing to it and ascertaining the true nature of the junction. It is quite possible, on the other hand, considering the overfolded character of the sedimentary beds to the north that this is really the faulted junction of a thrust plane.

Conclusions regarding Stratigraphy of Mount Everest and Rongshar Regions.

Some attempt will now be made to synthesize the information gleaned from the above localities and construct a stratigraphical picture of the whole region.

For many years controversy has raged around the true origin of the

Himalayan Gneiss, the " Central Gneiss " as it was once called, as to whether it were an intrusive igneous rock, or whether it represented an extreme stage in the metamorphism of ancient sediments; whether, in other words, it were an " ortho-gneiss " or a " para-gneiss " respectively. Reference has earlier been made to General McMahon's work in proving that it, or at any rate a large part of it, represents an ortho-gneiss. Mr. R. D. Oldham has shown that it may be almost impossible to distinguish even microscopically the gneiss that was once a sediment from that truly an intrusive granite, and that field relations must be the chief factor in determination.

When I first reached the Mount Everest region I took the banded biotite gneisses, so prevalent there, as unquestionably intrusive in character. It seemed to be only one more example of the great lateral extent to which intrusive rocks can travel in sills of nearly constant thickness. It seemed possible, though, that this might have been emphasized subsequently by overthrusting and rolling out of the beds upon one another as suggested by Heron. But my investigations, brief and incomplete as they were, have brought me more and more to the view that this particular series of banded biotite gneisses represents in actuality a highly metamorphosed series of sediments probably argillaceous and arenaceous in general character. Disregarding their strikingly bedded appearance, which is mainly due to the wholesale injection of pegmatite along foliation planes, their regular position between the upper and the lower calcareous series throughout the Mount Everest and Rongshar regions, and the absence of any evidence of apophyses running off into these series, seem to indicate with a fair amount of probability that they are of sedimentary origin. The difference between this biotitic felspathic gneiss, often garnetiferous, and the augen gneiss of the deeper core of the range has already been remarked. I could find no occurrence of the latter in the Rongbuk district, nor indeed on the northern side of the main range.

As to the upper calcareous series that forms the calc gneisses and calc schists of Everest and also those of Kyebrak, they would appear to be the natural outlying extensions to the south of the so-called Permo-Trias limestone series, and their metamorphosed condition due to their being in the zone of maximum stress. If the upper calcareous series and the bedded gneissose series be definitely proved by future work in the region to be stages of a single sedimentary series, or separate ones not far removed in time, it may be possible (and their position suggests it) to link them up with Hayden's Dothak (Lilang) series of Phari, which has comparable lithological zones, though less metamorphosed.

The lower calcareous series, completely recrystallized to marbles, slates, schists, etc., that is only found beneath the bedded gneiss, would appear by its position and advanced state of alteration to be a much older series. Those exposures on the Tibetan side may conceivably be

referred to Hayden's Khongbu Series of undoubted Pre-Jurassic and probably very much older Purana age, found also near Phari; while the lithologically similar assemblages found deep down in the Rongshar may be analogous to the Mallet's Daling Series of Sikkim or the Baxa Series of Southern Bhutan. But these are only suggestions, and much further work must be done before such correlations can be safely made.

I must mention that in my reading of the structure of this region I have endeavoured to avoid the invocation of elaborate movements or even of extensive overthrusting. Overfolding and complicated dislocations without doubt there are in the area of the younger and more yielding Tibetan sediments, but on the northern borders of the main range the more compact and indurated rocks are strikingly free from much appearance of lateral thrust. I sought in vain for real evidence of an overthrust and only at the junction of the Liassic (or Permo-Trias) limestone with the banded gneisses in the Dzakar Chu, already cited, was I able to recognize such a possibility. The complicated nappes and decken movements of the Alps do not appear to have afflicted the Eastern Himalaya—at any rate as yet, and it is better, I think, to postulate rational, rather than irrational, quantities to elucidate problems on first acquaintance with a region.

But if evidence of lateral thrusting is meagre, it is not at all the case with vertical movements. On all hands throughout the small portion of the Tibetan side of the Central Himalaya I traversed, there is plain evidence of great vertical uplift. Chomolhari raises its head nearly 9000 feet abruptly from the Tibetan plain. Almost more impressive still is the great gneissose wall of Kanchenjhao and Chomoyumo in the north of Sikkim rising vertically out of the sediments of the Kampa plain. Many observers have of course seen ample signs of special elevatory forces, other than mere folding or intrusion alone, to give such prominence to this great sector of the Earth's crust, and it seems more than probable that the supremacy of Mount Everest itself, since we now know it to be in greater part of soluble calcareous rocks, must be largely due to vertical uplift in the past that may be continuing at the present time. It is not outside the bounds of possibility that the next climbing party may have a few more feet to go to reach the top!

The Kampa System and Jurassic Shales.

As mentioned earlier, I have very little to say in regard to the rocks of the Tibetan plateau, which date roughly from Jurassic to Eocene. The hurried outward and return journeys prevented more than passing observations, and these were mostly confirmatory of Heron's much more detailed work. The absence of the latter in India (I had only the opportunity of seeing him for half an hour in Edinburgh before he returned from leave last autumn) and our consequent inability to compare notes,

may detract somewhat from the value of the following short remarks on the above rocks, and modification may later be necessary.

On the return journey *viâ* Tingri I made an abortive attempt to reach the Permo-Trias area to the north and north-east of the sacred Lapche Kang Range. The pony that carried me paid far too much attention for my liking to her foal that accompanied us, and too little to the business in hand, and always tried to bite me whenever I suggested that we must be getting along; and indeed she was so far uninterested in the local geology as to once run right away, and I only caught her after a long chase by the dangling reins tripping her! In consequence I eventually only reached the neighbourhood of Kura at the south-western extremity of the vast Tingri plain. Coming from Sharto, south-south-west of Tingri; one skirted along the spur to the west that submerges itself at Shar in the alluvium of the plain. This seemed to be formed of dark sandy limestone weathering reddish, and it had a very slight northern dip. The hill against which Kura stood was of the same sandy limestone, dipping north, and forming with another outcrop across the valley, dipping south-by-west at 65°, an isoclinal anticline. No fossils could be found, but the writer knows of no arenaceous limestone of this character except within the Kampa System. Further south-west along the ridge, against this limestone anticline was faulted an anticline of dark shales with the steep limb to the north, and then followed a rusty limestone, the beds of which curved round to vertical, where they in turn were faulted against the steep limb of the shales. Subsequent folds revealed successively white calcareous sandstone, dark calcite-veined limestone, and reddish quartzite, that seemed to abut against the crystalline metamorphics without the intervention as far as could be seen of the Jurassic shales. The above sequence of folds could be roughly traced across the valley to the east in the shoulder running north to Shar, as already mentioned.

Now the hill behind Kura, as well as much of the rising ground beyond to the west, has been mapped in 1921 as alluvium, and this without doubt is a mistake. More important is the mapping of the sandy limestone at Shar as Jurassic, when it would appear, unless Heron found fossil evidence to the contrary, that this represents one of the typically similar limestones of the Kampa System. It would certainly seem that in these folded rocks at Shar and at Kura, as well as further west, we have at least some representatives of the Kampa Series. The ill representation of the Jurassic shales, if the above shale beds are in fact these at all, may be explained by the close folding and evident reverse faulting that have cut out no doubt a considerable proportion of known zones. The prevailing pressure from the north would seem here to have brought the Kampa beds right up against the Metamorphics, or otherwise regarded to have entrapped synclinally a Kampa outlier within the older folded Jurassic rocks.

Lapche Kang (Munkri) Range and Gyankar Range.

The above-described locality, south-west of Tingri Dzong, is of considerable interest on account of its being at the north-eastern extremity of the great Lapche Kang Range, which, like the similar and parallel Gyankar Range 80 miles to the east, raises its jagged crest in a direction roughly transverse that of the general trend of the Himalayan ranges. To the writer the existence and strike of these two ranges are highly significant, and they appear to have had a marked effect upon the river-systems of the country, particularly in the case of the Gyankar Range. The latter was investigated by Dr. Heron in 1921, more especially in regard to the remarkable gorges through which the Yaru Chu and Arun make their way. The Gyankar and Lapche Kang Ranges are evidently not due to a transverse system of folding but to intrusions of granitic rock along these lines. Their relation to the geological structure and drainage of the region, apart from the direction they take across the strike of the main ranges, suggests that they have undoubtedly arisen subsequent to the latter. This assumption, at any rate, would help to explain the extraordinary deflection of the Yaru Chu east of Nyönne Ri and Sangkar Ri, which possibly had its continuity with the lower Arun interrupted by the range rising faster than the river could keep open its channel across this area, the formation in consequence of a lake, and final outlet through the Rongme Gorge to the north—a similar chain of processes that I believe Mr. C. C. Fox (*Geographical Journal*, vol. **59**, No. 6, p. 433) has suggested for the remarkable lower gorge at Yö Ri. Dr. Heron has mentioned that at Yö Ri the river plunges into a gorge of hard gneiss, but I should like to have the actual formation here confirmed. If, as I suppose, both these ranges mark intrusions late in the scheme of events, then it is of interest to know whether they are not of the later granitoid rocks, *i.e.* the schorl granite, or the two-mica granite of the Northern Range that Heron found in a good many localities, or even, with some slight possibility, the hornblende granite that Hayden mapped in the neighbourhood of the Tsangpo. The concentration of intrusions of the two-mica granite in the Northern Range, particularly on the prolongation northward of the two lines of ranges, rather suggests that the latter may be genetically connected with them. Heron's reference to the rock at Yö Ri being gneissose may be on account of local foliation at the time of its intrusion.

Dra and Ruli La.

Shebbeare and I, having crossed the Tse La southward to the Dzakar Chu, made great efforts on the return journey to reach Yö Ri in order to examine the problem of the latter's gorge in particular, as well as the bigger problems of the uplift of the Gyankar Range and the relation of the Permo-Trias limestones to the Metamorphic Complex in that area. The Dzakar Chu was however hopelessly flooded, and we were quite

FLUVIO-GLACIAL TERRACES IN THE ARUN VALLEY ABOVE KHAIKHUNG, WITH MOUNT EVEREST IN BACKGROUND

OLD LATERAL MORAINE SHELVES AND TERMINAL MOUNDS OF THE RONGBUK GLACIER, NEAR BASE CAMP

THE "TROUGH" OF THE EAST RONGBUK GLACIER, SHOWING VERTICAL VEIN-STRUCTURE OF ICE-WALLS AND PINNACLES

LOOKING DOWN RIGHT MARGIN OF THE "TROUGH," FROM ABOVE CAMP II.

unable to cross even as far up as Dra or make progress along the river gorge. We were obliged, therefore, to strike up into the hills from Dra in order to cross the Ruli La and so catch up our main party by forced marches to Tinki. This trek from Dra to Tsogo took us across a stretch of country apparently not previously visited, if one may judge by the variance between map and topography. Geologically this region has been mapped as Jurassic, and in greater part no doubt it is, but there is also ample evidence of Kampa System rocks squeezed in the tightly packed folds of the Jurassic. Our hurried march, however—not facilitated by a blizzard on the Ruli La at over 18,400 feet—prevented my mapping the actual extent of Kampa rocks in the neighbourhood.

Synclinal Valleys.

One of the very interesting discoveries that Dr. Heron made in the Tibetan area was the existence of rivers occupying synclines or structural basins, as opposed to the much more usual occurrence of anticlinal valleys, which structurally are so much weaker towards erosion. Though Dr. Pascoe has suggested a word of caution (*Geographical Journal*, vol. 59, No. 6, p. 436) in regard to the too hasty acceptance of these synclinal valleys, considering rather that the differential erosion resistance of the Cretaceous limestones and the other rocks may be the chief cause of these features, yet it would appear quite feasible in areas of such pronounced and abrupt overfolding, as has taken place along the line of the Phung Chu, for these to arise. I did notice, nevertheless, that near Kyishong, east of Shekar, the Phung Chu appeared most decidedly to occupy the deeply eroded axis of an anticline, both limbs of Kampa red arenaceous limestone dipping outwards into the hills on either side. And such an anticline in this particular locality would appear to be more consistent with Heron's own mapping, since just westward of this an anticlinal axis is indicated, which I was able to confirm on the ground. Also in the valley of the same river east of Tingri Gankar, in the neighbourhood of Memo, the limestones on either side seemed to dip steeply outwards, the channel occupying the broken crown of the arch, though there were in addition many minor folds in the steeply upturned limbs of the anticline. But apart from these two instances I was not able but to agree with Heron in his main contention that the Phung Chu does actually in parts of its course occupy synclinal valleys.

Basic Igneous Rocks.

The only occurrence of these I found was a pronounced dyke 6 or 7 miles south of Shekar, not far from the valley of the Phung Chu. It was a dark, much-decomposed rock that had been intruded along the strike of the very steeply dipping Jurassic shales, and these had been considerably baked in its vicinity. Later faulting had, however, pronouncedly affected the shales and the included dyke.

No rocks of this description were observed nearer or within the zone of the Metamorphic Complex.

PART II. THE GLACIERS

The Mount Everest Massif has all the characteristics of a mountain region in an advanced state of glacial erosion and corrosion, whether we attribute the greater cause to the mechanical action of glaciers or to frost action. The long " through " glaciers, whose heads and tributaries have eaten their way back into the innermost recesses of the mountains to form innumerable cirques and corries, delimited by sinuous ridges and steep arêtes, all point to a state of nearly mature glacial denudation. But though the present length of the glaciers on the northern side of the range is considerable—the Rongbuk Glacier is about 11 miles—yet it is nothing compared with their former extent. On all hands it is evident that the glaciers of this region are shrinking back into the recesses where they have their birth. And this does not appear to be seasonal variation alone, but, in common with so many other glaciated regions of the world at the present time, a secular movement in a retrograde direction.

Take, for example, the valley of the Dzakar Chu. This long U-shaped valley bears all the signs, even in its lower parts, of having been sculptured directly and indirectly by glacial action, and banks of moraine attest to its former occupation by ice. In its upper parts above the Base Camp are conspicuous three systems of moraine shelves extending along the valley sides one above the other. They are especially noticeable on the west side, though the uppermost shelf at the foot of the crags is discontinuous owing to its being broken across at places by drainage from the corries. These morainic terraces far above the level of the present lateral moraines of the Rongbuk Glacier, can be said to correspond to periods of stagnation in the gradual retreat of the once enormously vaster glacier, since the maximum ice flood of the Glacial Cycle. That the Rongbuk Glacier has halted at times in its retreat is also borne out in an interesting way by the large mounds of terminal moraine that it has dumped at intervals in the bed of the valley, the greater segregations being separated by areas relatively clear and level. Our Base Camp was situated on one such collection of mounds, and for nearly $\frac{3}{4}$ mile ahead of this was an even plain, levelled no doubt to some extent by the outwash from the glacier, right up to the present moraine-covered snout. Other evidence of progressive retreat is to be found at the termination of the East Rongbuk Glacier, which has shrunk back nearly a mile from its former confluence with the main Rongbuk Glacier.

Evidence of three separate periods of glacial extension has been discovered by Oldham in Kashmir, and similar oscillations have been observed by Huntingdon in the Pangong valley of Ladak, but it would be altogether premature at this juncture to suggest correlation between these and the movements of the Mount Everest glaciers so far to the east.

Conditions at the North Col.

In the mind of the writer a particular and somewhat peculiar local case of this wholesale waning of glaciation is to be seen at the North Col, between the peak of Mount Everest and Changtse. Here is a col at 23,000 feet piled up in the most impressive and weirdest way with gigantic blocks of ice, their sides clean cut for the most part, seeming to be the disrupted fragments of a much greater mass of ice that once capped the col. The eastern slopes of the col, up which lay our regular route, consisted of hard névé at an average angle of about 35°, broken at intervals by schrunds and ice facets. The western face towards the West Rongbuk Glacier is mostly of steep ice-slopes. Now, in this high country with such evident signs on all sides of slight precipitation, and probably increasingly so, it is extremely difficult to see how the present snowfall is sufficient to give this enormous accumulation of ice on the eastern side and maintain it constant in such vast amount and in such a position. And if it were so, it seems incompatible indeed with the occurrence of the great disrupted blocks of well-consolidated névé on the top of the col, which under normal conditions of annual precipitation would be speedily submerged and formed into a regular and continuous cornice. Col. Norton, on the other hand, considers that the present snowfall, concentrated on convergent lines into the funnel that the North Col forms, is probably sufficient to explain the amount of the ice present, though he admits the difficulty in this view of explaining the well-consolidated cut-up blocks at the top. In my opinion this great ice mass in all probability represents the lingering remains of a once greater amount that may have been more uninterruptedly continuous with the East Rongbuk Glacier when the latter at an earlier period filled its basin to a higher level: in other words, it may be described as a relic of the past—a mass of "fossil névé."

Motion of the Glaciers.

The northern side of the Great Himalaya is a region that exists in, and is subjected to, a set of physical conditions unique probably in the world, and the effects of these conditions on its glaciers are correspondingly great. Low mean annual temperature, extreme dryness, great altitude, together with a tropical sun, must be expected to produce marked results, quite different from other effects in glaciated regions of more temperate climate and of other latitudes. In many of the phenomena I was reminded of the Arctic, the glaciers of Spitsbergen in certain respects exhibiting comparable features. Owing to low mean temperature the ice of these Mount Everest glaciers must be proportionately low in temperature, and this will mean that it has a correspondingly higher degree of rigidity or viscosity, whatever may be our views as to the ultimate structure of glacier ice in general and its mode of flow. Mostly the ice is of a very coarse texture, the granules being on the whole about the size of walnuts, a

condition in which they simulate Arctic glaciers more than they do Alpine. On account of the rigidity of the ice the motion of the glaciers will be slow. Somervell and I endeavoured to estimate the rate of flow of the East Rongbuk Glacier by the motion of one of the pinnacles well out in the ice-stream. In ten days we found it had moved only about 2·5 feet, equivalent to 3 inches per day. Such observations as have been made on the motion of Himalayan Glaciers on the southern side and at the north-western end of the range, have given a diurnal motion of 3 to 5 inches at the side, and 8 to 12 inches in the middle.* Though our observation was an isolated one in the lower part of the glacier and but roughly undertaken, it seems to indicate a relatively slow rate of movement for these glaciers, such as would be expected. But though the velocity be low it must not be supposed that the erosion of their beds by the glaciers will be correspondingly less, for the extra rigidity of the ice will hold stones in the base of the glaciers with increased firmness and abrade the bottom with greater force. The gigantic moraines of these Mount Everest glaciers are evidence enough of the destruction wrought mechanically by the motion of the glaciers, apart from that brought about by the agency of frost action.

Length and Minimum Altitude of Glaciers.

The present lengths of the glaciers of the Mount Everest region compare fairly favourably with those of other parts of the Himalaya, and are only notably exceeded by the immense "longitudinal" ice-streams of the Karakorum. The Rongbuk Glacier system has a greatest length of about 12 miles, and the snout is at an altitude of nearly 16,500 feet; while the Kyebrak Glacier is nearly 11 miles in length and descends to about 15,400 feet. These are the two principal mapped glaciers on the northern side of the main axis, and typify the "transverse" glacier, that is one flowing down a valley at right angles to the range. Elsewhere in the Himalaya the latter never attain the size of the longitudinal type, which occupy troughs between the ranges. The only mapped representative of the longitudinal variety is the Kangshung Glacier on the northern side of the Makalu Group, which has an approximate length of 12 miles, and whose snout is at 14,600 feet above sea-level. As an eastward-flowing glacier it is comparable to the Zemu Glacier of the Kangchenjunga Group, which however has a length of 16 miles and descends to 13,900 feet. That none of these figures for the minimum altitude reached by the glaciers is as low as those of the north-western end of the range is probably chiefly on account of the lower latitude, though other factors of local situation, supply, and gradient must always be taken into account. The glaciers of Kumaon and Lahoul have a lower limit of 12,000 feet, while those of Kashmir descend to about 8000 feet in some cases.†

* D. N. Wadia, 'The Geology of India,' p. 15.

† *Ibid.*, p. 14.

Wastage Effects.

In spite of the low mean annual temperature from which this region suffers, its situation in such a low latitude (28° N.) causes it to experience the effects of a very hot sun. On the North Col at 23,000 feet on more than one occasion when I took temperatures at midday, the air temperature was 29° F. whilst the sun temperature at the same time was 105°. In such a degree of heat with a high-pitched sun melting effects on the glaciers and snowfields are immense, though actually the visible melting is surprisingly little, the high evaporation under such low atmospheric pressure causing the solid forms of water to pass direct into vapour without the intermediate liquid state. High up on the face of Mount Everest this is strikingly the case, and a considerable snowfall will in spring and summer have evaporated into thin air in a few hours without any visible melting. Consequently, and fortunately, " verglas " does not exist. On the glaciers the same condition holds in less degree, and it is only in their lower parts that streams of any size develop, and then not in our experience till the end of May. The intense ablation of the glacier surface gives rise, amongst other things, under these conditions to the remarkable ice pinnacles to be shortly described. And in spite of this ablation, and in contrast to the dirt-strewn glaciers of the north-western end of the Himalaya, these in the east and on the north side of the range are relatively clean. The Kangshung Glacier, however, on the southern side of the main axis shows in the photographs taken in 1921 a decidedly dirty surface due to mud or moraine. This may be owing to the even greater ablation that goes on on the warmer southern side ; at the time these photographs were taken the monsoon was actually in progress.

On the other hand, it might be suggested that this effect is partly due to the deposition of dust borne on the prevailing winds from the plains of India, as has been claimed for the dirty state of the ice of the north-western glaciers, but since the prevailing winds at Mount Everest appear to be westerly this can hardly be maintained. In Spitsbergen, after a period of great ablation and thaw I have seen the glaciers appear quite black, and in that remote region dust deposition cannot obtain ; on examination the incorporated dirt has proved to be highly comminuted mud derived from the rocks over which, or between which, the glaciers pass, which is concentrated by the action of thaw and ablation. The state of the Kangshung Glacier is, nevertheless, most probably brought about by the greater temperature variation of this south side, increased frost action, and consequent extra rock-waste from the surrounding cliffs, and from the south-east face of Mount Everest in particular, where the inward dip of the beds lays them open to special attack.

On the East Rongbuk Glacier were some rather beautiful examples of the so-called " cryoconite holes " or " dust wells," in which small particles of morainic material had melted their way down into the surface

of the ice, as is so often to be seen on Arctic glaciers especially. Here, with the high altitude sun, the small stones and particles had melted their way very deeply down, and the wells becoming filled with water during a warm period it had later crystallized in a radial manner, and given the effect of round flower-like forms of clear ice within the surface of the glacier. The typical honeycombed ice of the Arctic was however not noted to any extent.

A striking example of the effects of a tropical sun is the way in which eastward and westward flowing glaciers frequently have their southern sides melted back into steep ice-cliffs, a case in point being the tributary to the East Rongbuk at Camp II., though others on the eastern flank of the latter were equally affected: this action is aided by re-radiation of heat from rock-walls enclosing the glacier.

An important factor in promoting ablation is the high wind, and we had no better example of its force than near the Base Camp. Here reinforced by sand, and impinging on blocks of granite, situated in gaps between moraine heaps, it was sufficient, blowing through these funnel-like gaps, to have grooved the blocks on their windward southern faces to a depth of an inch or more—long incisions across them independent of their mineral character and cutting across crystals of felspar and tourmaline alike. The sand-blast had been sufficiently intensive to have done its work since these morainic blocks were dropped by the glacier, now not much more than half a mile away.

A melting effect, which unfortunately I never had the opportunity to examine close at hand, is the conspicuous flutings on many of the peaks, particularly on their northern faces. The Lingtren Group of peaks at the junction of the main Rongbuk and West Rongbuk Glaciers are notable examples of this. Many travellers have no doubt considered such flutings elsewhere to be merely the result of a scoring and gouging of the face by falling cornices and avalanches, and the writer must admit that he had formerly rather subscribed to this view. But it is evident in numerous instances that the sharp ridges and arêtes above these fluted faces do not, nor ever have, supported sufficient snow or ice to gouge out by their fall such deep incisions. I could only conclude, from rather distant observation, that the flutings and ribs, which often extend in pronounced degree right up to the crests which support them, must be caused by a differential melting effect of the rays of the hot sun inclined obliquely to the face on which they act; though here again melting and consequent fluxion in the ordinary sense, owing to the high altitude and quick evaporation, is non-existent. I am not aware that the phenomenon is known, at any rate in such pronounced form, outside the Himalayan range, though it may possibly be seen in other high ranges of the tropics.

The Trough.

This interesting and possibly unique feature that provided a natural causeway for nearly 2 miles of the way up and down the East Rongbuk Glacier between Camps II. and III., will ever be remembered as a fairy scene, of the greatest beauty, by those privileged to use it as a highway to the precincts of the throne of the Great Goddess—Chomolungma. Imagine a corridor up to 50 feet deep and 100 feet wide with steep sides buttressed and pillared with fretted ice of exquisite tints of blue and white and green, and paved at intervals with the ice-covering of charming glacial lakelets, out of the surface of which were growing here and there clusters of ice-pinnacles, themselves sculptured into an infinity of forms. It was through scenery of this description that our way lay—exhilarating in the extreme, except at the hot hours of the day in late May and June, when the close stagnant air within the depression of the Trough was apt to produce a certain lassitude and disregard for its remarkable beauty!

The Trough, as a depression running longitudinally down the East Rongbuk Glacier, may be said to commence somewhere about the 20,000-foot contour of Major Wheeler's 1-inch map, and it continues uninterruptedly as far as the moraine-strewn lower end of the glacier. On first acquaintance I was at a loss to account for this remarkable feature. In early May the winter snow was still forming a practically continuous covering over the upper half of the East Rongbuk Glacier, and it was in consequence impossible to make any examination of the nature of the ice in the neighbourhood of the first pronounced depression. I noticed, however, that the snow seemed to be concealing a notable amount of ridging of the ice near the commencement of the Trough proper. It was not till later, when the new snow had evaporated sufficiently to reveal the underlying ice, that it was apparent that the latter exhibited plain evidence of severe stress. Here on the prolongation of the line of the Trough was a beautiful development of Forbes' "Ribbon or Vein Structure"—clear blue bands of ice alternating with granular and more opaque air-filled varieties, the whole running parallel with the direction of motion of the glacier. It will be remembered that Forbes, who first described this "ribbon structure" during his classical researches on Alpine glaciers, showed it clearly to be a structure set up in ice in consequence of great compression and shear; in fact, it is precisely comparable to the foliation of rocks under like conditions of stress. Without following Forbes *in extenso* in his ideas of the true plastic character of ice and the consequent viscous flow of glaciers, developed partly around his discovery of the "ribbon structure," the writer has from his own observations in the Alps, Spitsbergen, and the Himalayas seen sufficient evidence to satisfy him that this banded "ribbon structure" in ice, usually seen vertically disposed, though by no means always so, is definitely and chiefly brought about by intense compression, such as at the junction of two convergent ice-streams, and is not to be confused, as some glacialists

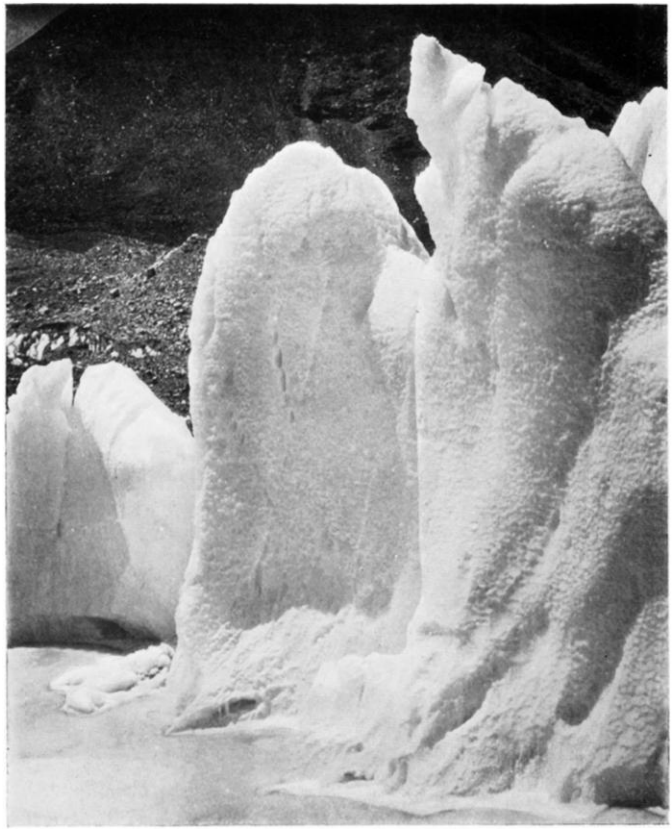
have done, with the bedded structure of glacier ice due to seasonal ablation and deposition, or concentration of silt in layers within the ice.

That the ice above the Trough was undergoing severe stress was apparent not only from its foliation, but also from the faults—" flaws " or " tear-faults "—that had been extensively developed in this area, indicating that the ice was endeavouring to adjust itself to exterior forces ; and where dislocation did not bring relief a ridging up of the ice was prevalent, as referred to above. At the commencement of the Trough itself the foliation bands seemed to have reached their greatest development, actual fusion of the ice taking place from the heat engendered by the compression, accompanied by simultaneous evaporation of the fused ice. And on this line of fused ice the depression of the Trough seemed to have developed, its walls displaying the banded structure in decided, though less pronounced, degree, and standing somewhat in relief above the general surface, on account, no doubt, of adjustment to stress.

Now the distance of the line of the Trough from the true left side of the glacier is about 400 yards, and coincident with it seems to be the medial moraine from the north-east shoulder of Mount Everest, carried englacially, for patches of moraine appear at intervals in the bed of the upper part of the Trough. Below the 19,750-foot contour it converges with the moraine coming from the north spur of Pt. 22,090, and this material largely carpets the continuation of the depression down the left centre of the lower glacier. The weathered walls of this lower part showed marked traces of the longitudinal banding due to their earlier foliation.

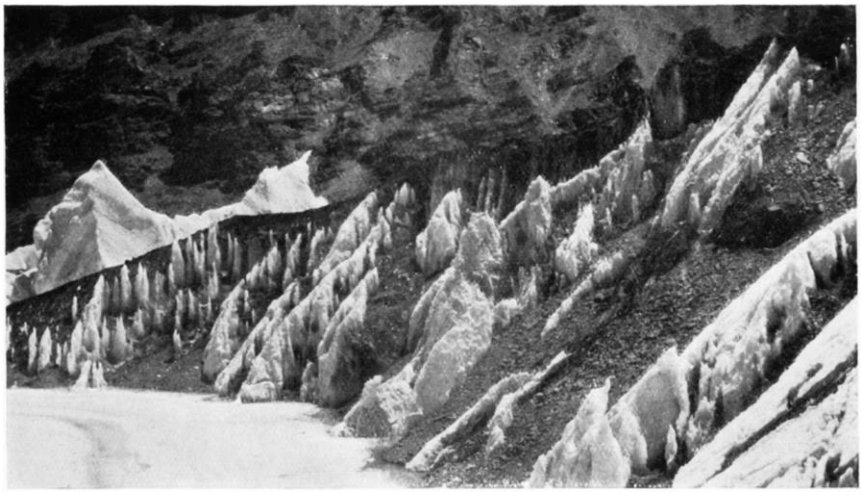
The Trough seems to be a line of special stress between the two ice-streams, the one made up of the tributaries from the North Col and eastern slopes of Pt. 22,090 of Changtse, and the other the main mass of the glacier to the east, and its formation would appear to be due to the compression of the smaller western ice streams by this main eastern mass, especially in the narrow constriction between Pt. 22,090 and the opposite side (western spur of Khartaphu), through which the whole of the glacier must pass. A glance at the map will show clearly the bottle-neck character of this outlet and how at the critical point an extra tributary from the western slopes of Khartaphu adds its quota of ice to the already constricted mass. And it is just here that the conditions of stress above referred to are met with, and the Trough develops. The constriction appears to set up forces of compression and shear that along the line of englacial moraine from the north-east shoulder reaches its maximum, the upper layers of ice being fused and the lower layers only retaining their necessary viscosity or rigidity on account of their solid morainic content.

It may be objected that if, as postulated above, the ice is definitely fusing under compression, it should appear in the liquid state along the line of greatest stress, and perhaps even be present as a stream of water



INCIPIENT ICE PINNACLES FORMED FROM THE WALLS OF THE "TROUGH"

END OF TRIBUTARY TO EAST RONGBUK GLACIER NEAR CAMP II., SHOWING SEASONAL BEDDING SPLIT INTO PINNACLES BY MOVEMENT AND MELTING



"NIEVES PENITENTES" FORMED FROM AN ICE-CLIFF, EAST RONGBUK GLACIER

PINNACLES OF THE "TROUGH"

PINNACLES OF "TROUGH," SHOWING STEEPEST SIDES TO THE SOUTH

flowing down the Trough. Actually the latter showed no signs of earlier or later water erosion, nor was there present in it a stream of water until late May, and then only in its lower part after its junction with the moraine from Pt. 22,090 above referred to. On theoretical grounds, even if partial melting took place with the development of interstitial or interfoliate water along the line of greatest compression, such water as was liberated at the surface would tend to be quickly evaporated under the prevailing conditions of aridity and low pressure. Whilst in the light of Mr. C. S. Wright's researches on Antarctic ice and his conception of ice structure on the line of the quantum theory (to use his own words, *Geogr. Journ.*, March 1925, p. 212), " the development of heat by pressure should not bring about melting, but the resulting energy cause an increase in the number of mobile (' vapour ') molecules which merely have a tendency to diffuse to points (within each individual crystal) less favoured in this respect." And it must be noted that " this diffusion does not require a free surface for its operation." In this view, presumably, the line of the Trough, owing to the operation of exceptional outside forces, should have an increased mobility; and it may be this which helps to produce a drag and cause the system of faultings above its commencement, already referred to.

The Trough therefore, in my opinion, would appear to be a permanent feature of the East Rongbuk Glacier; permanent, that is to say, under the present conditions of glaciation. That the explanation given above is probably not the whole story of its origin I am quite prepared to admit, for though my conclusions as to its formation were formed on the spot, they were made somewhat hurriedly in the little time available. And, moreover, it was more and more impressed upon one during one's short stay that the unique glacial conditions of this region are deserving of years of special study to understand all fully.

Ice-Pinnacles.

Connected with the phenomenon of the Trough was the perhaps even more striking one of the gigantic ice-pinnacles, that have lent themselves so well to photography. They had their best and largest development in the lower part of the Trough, though their birth was traceable to the walls of the upper portion. As these walls became weathered and melted back differentially during the bodily progress of the Trough down the glacier, buttresses and spurs make their appearance, and tend eventually, in proportion as the processes of ablation and thaw increase in the lower reaches of the glacier, to become detached and stand in isolated masses. And an important factor, which promotes undoubtedly their tapering and spired form, is that of the high-altitude sun of these latitudes, which during the middle hours of the summer day can shine down on them from a position within comparatively few degrees of the zenith and so produce a nearly equal melting effect on every side. The slight inclination of the

sun to the southward does however, produce a marked steepness on all their southern sides.

In a similar way in different parts of the glaciers was to be seen the incipience of pinnacles from smaller ice cliffs than those of the Trough, the process being frequently started by morainic material (like small glacier tables) protecting the ice column beneath them from the steep rays of the sun, and when the protecting cap fell off, the pinnacle assuming a sharp conical or pyramidal form. A similar genetic process can be ascribed to the pinnacles of the main Rongbuk Glacier and others, the principal necessary conditions being a preliminary splitting of the glacier surface into cliffs of whatever size and steep solar rays to act upon them. The phenomenon of " nieves penitentes," first described from the Andes, is undoubtedly equivalent in its genesis to that of these enormously larger pinnacles, conditions of latitude, etc., being similar; in fact, typical examples of normal nieves penitentes were to be seen on the Mount Everest glaciers.

Earth Pillars.

Fine examples of these were to be seen on the steep slopes of old moraine above the end of the main Rongbuk Glacier. Some of them were 20 feet or more in height, although the capping stones, essential especially to the earlier stages of their growth, were in most cases missing. Their continuance in spite of this loss is only another indication of the diminished precipitation of the region.

Polygonal Surface Markings.

I was particularly interested to come across examples of these frost-jointing forms, since they are confined almost entirely to the circumpolar regions. I cannot here go into the question of the mechanism of their formation; suffice it to say that Mr. J. S. Huxley and the writer, from investigations in Spitsbergen, have already described the rôle of frost action as being the primary genetic process (*Geogr. Journ.*, March 1924). A climate that is fairly dry and has for a portion of the year at least a temperature alternating repeatedly on either side of the freezing-point, is productive of the best results. Hence the rare occurrence of the phenomenon in low latitudes, unless other factors such as altitude come in.

The present examples were seen at an altitude of about 17,000 feet on an old upper moraine terrace of the main Rongbuk Glacier on its eastern side. They were mostly stone polygons about 4 feet across, with a network of secondary fissure polygons within the former. The stone borders were composed chiefly of slatey material, as is so frequently the case in the Arctic, and on excavation these were found to be quite superficial, extending down only 2 or 3 inches into the mud. No " tjaele," or frozen soil, could be found beneath. In order to get some indication of the forces acting, and if possible to confirm our earlier views as to these, I displaced some of the stones from the borders, but in

the short interval of observation—about a month—no movement was discernible, though much drying out of the ground had taken place. Besides these compound " stone-fissure polygons," there were to be seen systems of the simple fissure-polygons, quite small in size, and with appearances of relatively recent formation, giving the impression in this case of desiccation rather than repeated frost action.

Former Extent of Regional Glaciation.

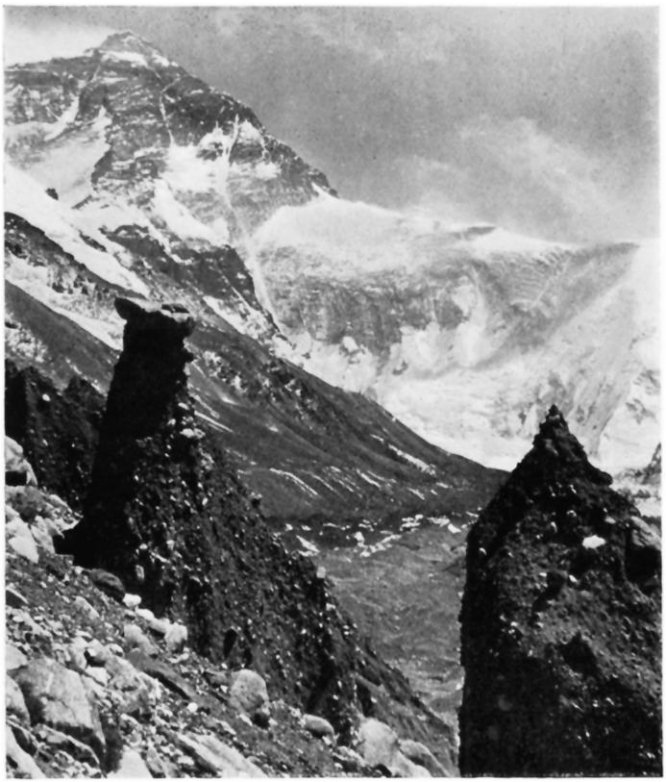
With such clear evidence in the Mount Everest region of a once greater extent of the glaciers, let us endeavour now to form a picture of the state of affairs when the maximum phase of the Glacial Cycle was operative. Reference has been made to the former much greater bulk of the Rongbuk Glacier. But I think without doubt the most amazing cases we saw of the once enormously greater expansion of these Tibetan glaciers was west of the Lamna La, where huge moraines bordered the valleys debouching from the south on to the plains. And perhaps the wide valley, in whose upper reaches lies the Kyebrak Glacier, was most impressive of all in this respect. Here immense morainic ramparts towered nearly 200 feet on either side above the wide alluvial valley, and extended to the Tingri plain, a distance of 15 miles or more from the present snout of the Kyebrak Glacier. Hence in all probability the present site of Tingri was once engulfed by ice. Now throughout our march from Sikkim by way of the valleys of the Chiblung Chu and Phung Chu was plain evidence in the systems of terraces along the hillsides of former extensive flooding of these valleys. In as far as I was able to investigate, these terraces in scarcely any cases indicated fluviatile action alone, and there can be no doubt that such accumulations of material as are to be found on the Lingga Plain, and in particular the typical boulder clay in the gap west of Kyishong, represent fluvio-glacial, if not direct glacial, deposits. In the hilly tract of country around the Ruli La, and particularly in a valley north of Dra, were to be seen terraces and cliffs of boulder clay, in places tunnelled out in a curious manner and presumably connoting the work of glacial streams during the local wane of the ice.

It is unnecessary to multiply these illustrations. Nevertheless, I must refer to the case of a peculiar find on the Phusi La at the head of the Rongshar Valley. Here Beetham brought to me a rounded clay pebble, split on one side and exposing the whorls of an ammonite cast: a specimen of indubitable Jurassic origin. As already mentioned, the rocks found *in situ* in this district are entirely of the pre-Jurassic Metamorphic Series, and there are but three possible explanations of the occurrence of this Jurassic specimen on the Phusi La. Either it represents an ice-borne erratic that has been carried something like 20 miles from the nearest Jurassic outcrops to the north and dropped on this pass of 17,000 feet under conditions which must imply an ice flood sufficient to overflow the lowest cols of the present divide of the main range and

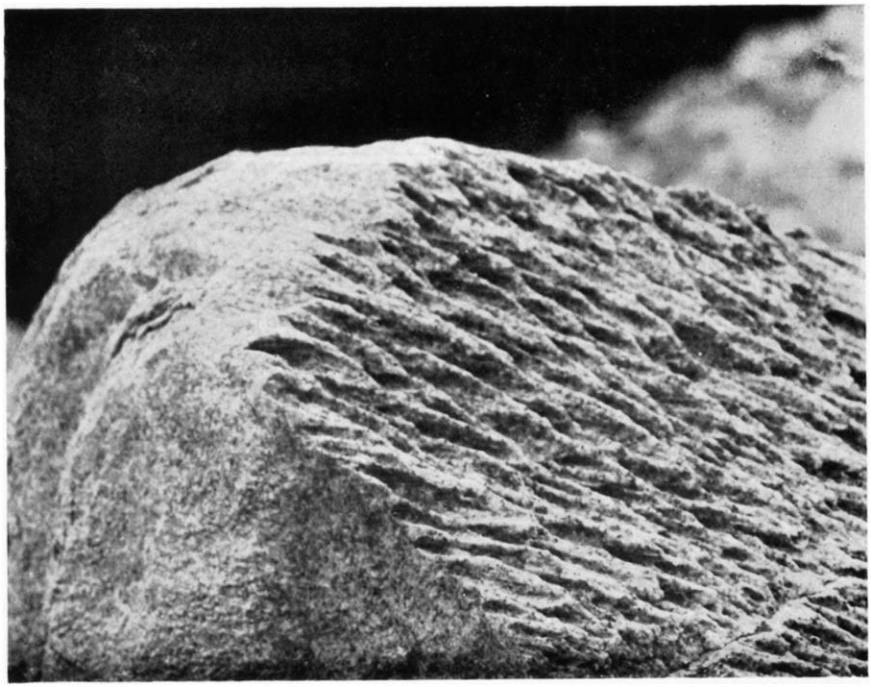
reverse the northward flow of many existing glaciers; or it was carried to the top of the pass and deposited there by some wily Tibetan in order to involve the inevitable foreign traveller in scientific difficulties and wranglings; or alternatively it was dropped accidentally (we must hope so in view of the last statement!) by Dr. Heron, when he crossed this same pass in 1921 with Col. Howard Bury, on the assumption that an unfortunate hole in his pocket let slip such a specimen that must have been collected many miles away in the Jurassic zone! Personally, I incline towards the first alternative, though the difficulties resulting in its adoption are very considerable. I could find no unequivocal evidence of other erratic material on the Phusi La, and the rounded character of the surface features may have been caused by sub-aerial action other than glacial.

Now if we consider, in the light of such morainic evidence as remains, what the effect on the country of the maximum phase of the Glacial Cycle must have meant, we must conclude that the ice completely blocked most of the valleys, and in fact that in many instances the ice-streams were linked up on this north side of the main chain. Whether during the maximum stage the ice-floods were ever sufficient to form a more or less continuous sheet, of the nature of what in the Arctic has been called "Highland Ice," is questionable; more morainic or other evidence must be found, apart from the solitary Phusi La specimen, before such a thesis can be confidently maintained. But if such were the case, the range lying to the north and forming the southern boundary of the Tsangpo watershed would have at any rate its passes overrun by the ice; and under similar conditions one can only assume that considerable portions of the Tibetan Plateau to the north would be in like manner engulfed.

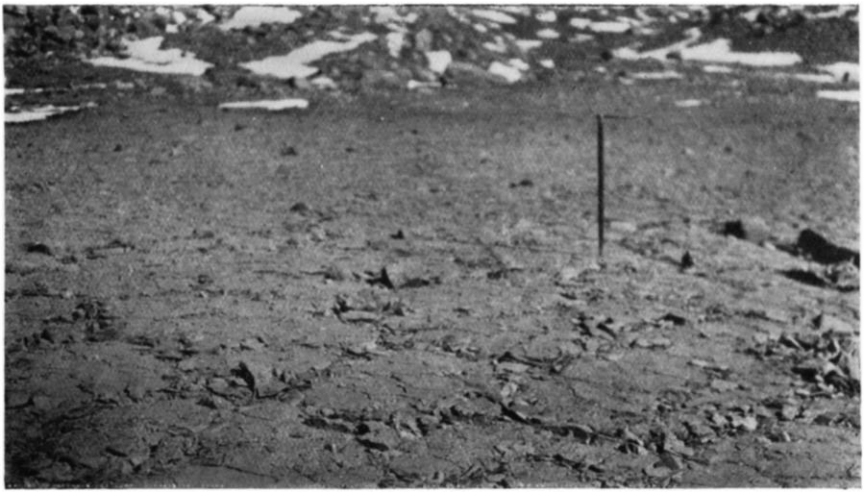
It is difficult to resist this inference when one considers such a highly elevated tract as Southern Tibet subjected to the frigid conditions known to have obtained elsewhere. At the same time the question must be borne in mind whether during the European Glacial Epoch the then precipitation was sufficient to accumulate the amount of ice suggested above—at any rate, in the plains of Central and Southern Tibet. Dr. Hedin has assured me that he found no certain evidence from glacial deposits of an ice-sheet as far south as the Trans-Himalayan Ranges. But for all that one must conceive of a great accumulation of ice in between the latter and the Great Himalayan Range, during the Glacial Epoch, for there is no reason to suppose that the general trend of monsoonic precipitation was much different then than now; and if, as the stratigraphical and structural evidence earlier cited rather suggests, the Great Range has become progressively elevated since Pleistocene times, due, possibly, to relief of its ice-load or some other isostatic adjustment, its once less formidable barrier may have allowed of even greater precipitation on the northern side than at the present time.



EARTH PILLARS ON OLD MORAINE OF RONGBUK GLACIER



SAND-BLASTED GRANITE IN WIND-GAP NEAR BASE CAMP



STONE-POLYGONS WITH SECONDARY FISSURE-POLYGONS WITHIN THEM: OLD MORAINE TERRACE OF RONGBUK GLACIER

CRESCENTIC SAND-DUNE IN PLAIN AT JUNCTION OF CHIBLUNG CHU WITH PHUNG CHU

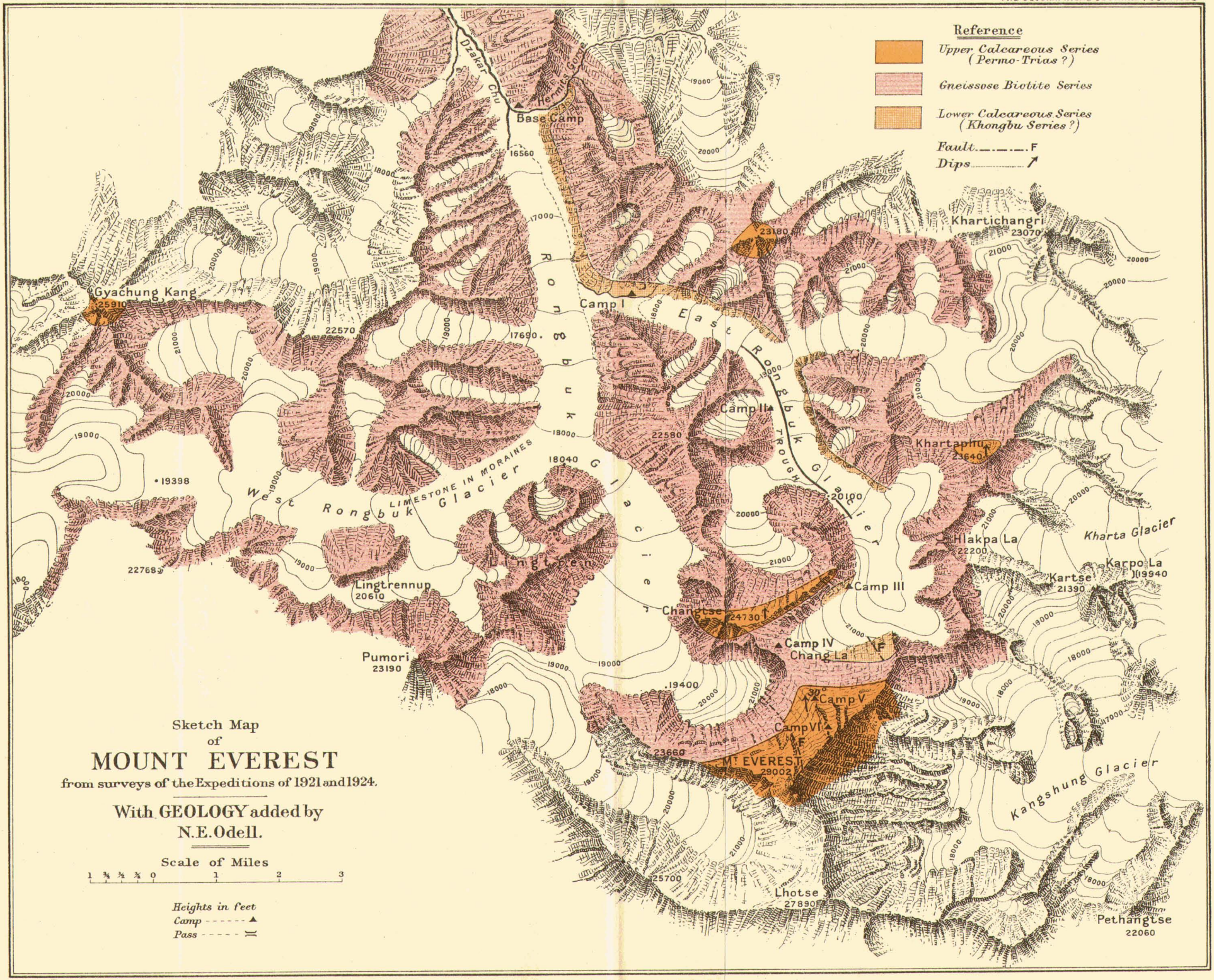
LOOKING DOWN JUNCTION PLANE OF UPPER CALCAREOUS SERIES (LIGHT) AND BIOTITE GNEISS (DARK) FROM 28,000 FEET ON MOUNT EVEREST

But whether regionally this were the case or not, the local maximum ice-mass in the Tingri and Kyebrak districts would have to be sufficient not merely to raise the present surface of the Kyebrak Glacier by over 1000 feet—an inconsiderable amount taking into account the subsequent erosion of its bed—but by such an amount more as would give a trend to the mass southward over the Phusi La and other passes, in order to carry the Jurassic specimen, and any other similar material, to its position on the former from the nearest parent outcrops to the north. Such an ice mass surging over the lower cols of the Great Range, would send its glaciers far down on the southern side of it, much below the limits reached by the present representatives.

Although I could find no unmistakable evidence in the Rongshar of the presence of a glacier below 14,000 feet, I feel decidedly that more extensive search than I was able to make, pent up as one was in what is most probably a profoundly "overdeepened" gorge, would reveal at least as low moraines as those found by Prof. Garwood in the Lachen Valley of Sikkim at 8790 feet: certainly at Trintang (12,000 feet) in the Rongshar could be seen a shelf on the valley side very suggestive of earlier glacier formation. And in regard to the suggestion that the Tibetan Plateau may at one time have had such an accumulation of ice that it overflowed the present waterparting, Dr. Blanford long ago showed that there was distinct evidence of such having occurred at the head of the Lachen Valley, a dictum in which Prof. Garwood was inclined to concur ('Round Kangchenjunga,' p. 299). Although without further extensive work it may perhaps be premature to suppose, as the writer has sometimes ventured, that the great transverse gorges of the Himalayan axis may have been largely due to the work of glaciers descending from a Tibetan ice-cap, or from a Highland ice mass as postulated above, yet we may consider that when the upper Arun basin was occupied with the ice it must have held during the Glacial Epoch, this mass and its concomitant moraines must have had a considerable effect, especially during its wane, upon the natural trend of the drainage, and very conceivably been the determining factor in the astounding course taken by the River Arun at Yŏ (Ri) and in its upper reaches of the Yaru Chu. All these fascinating problems can only be solved if and when political restrictions cease, and further work can be done amongst the innermost recesses of this important and little-known portion of the Great Himalayan Chain.

The map published with this paper is based upon Major Wheeler's survey of the immediate environs of Mt. Everest, with the geological formations roughly indicated. The other districts mentioned in the paper can be found on Dr. Heron's map (*G. J.*, June 1922) and the significance of the observations followed therefrom to some extent.

Before the paper the PRESIDENT said: This afternoon we are to have the result of Mr. Odell's observations upon the physiography of Mount Everest



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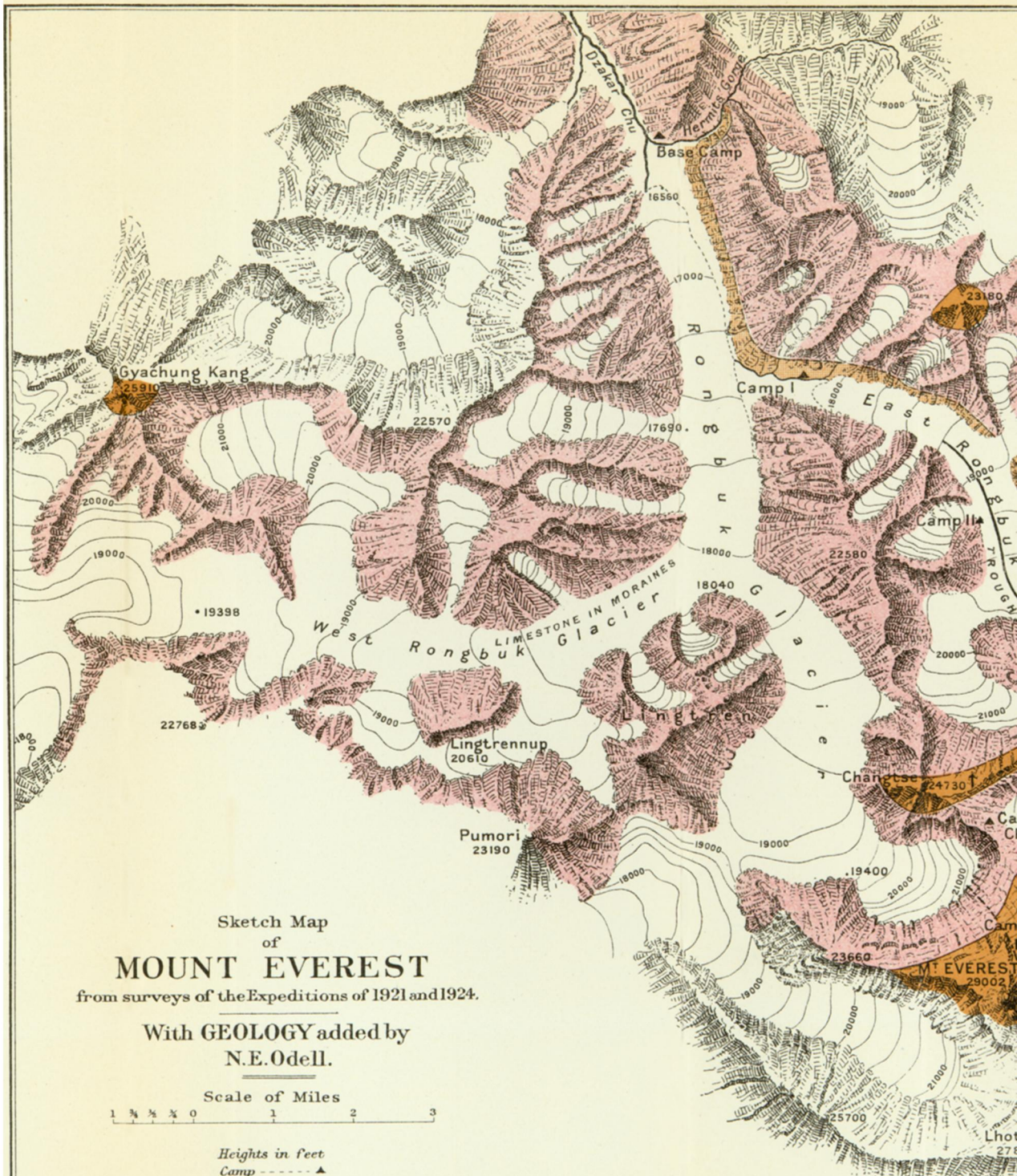
EVEREST - GEOLOGY
Odell



Sketch Map
of
MOUNT EVEREST
from surveys of the Expeditions of 1921 and 1924.

With GEOLOGY added by
N.E. Odell.

Scale of Miles
1 ¾ ½ ¼ 0 1 2 3

Heights in feet
Camp ------ ▲
Pass ----- ⌅

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EVEREST - GEOLOGY
Odell

made in the course of the last Mount Everest Expedition. I have not had the advantage of discussing with Mr. Odell the chief points of his paper, and I do not know, therefore, what particular points he is to deal with, but I understand that amongst the surface features of Mount Everest there are two which certainly require explanation in that one would not expect them to be there at all. The first is the immense mass of ice on the North Col with nothing, apparently, to feed it; and the other is the trough in the East Rongbuk Glacier. I will ask Mr. Odell to tell us what he has to say on the subject.

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

Mr. R. D. OLDHAM: I do not think I have anything to say, except that I have listened to the lecturer's paper with very great interest, and considerable admiration for the amount of work he was able to do, in very difficult circumstances. From personal experience of what working at high altitudes means, I can fully appreciate these difficulties, although my own limit never exceeded 20,000 feet.

Mr. A. F. R. WOLLASTON: I am not really competent to make any comments on Mr. Odell's paper, but I cannot agree with him with regard to his explanation of the mass of ice on the top of the North Col. I think that the amount of precipitation during the monsoon period is quite sufficient to account for it. If it were a decaying relic of a very large former mass of ice, I think it would take up another form; it would probably be flattening out. However, that is a matter of opinion. Moreover, I am not convinced by Mr. Odell's account of the causation of the trough in the East Rongbuk Glacier. It seems to me that a great deal more evidence is required before his explanation can be accepted as sufficient.

Mr. F. G. BINNEY: I am afraid it is rather a red herring to compare the trough in the Rongbuk Glacier with the so-called "ice-canals" which we found in North-East Land last summer. We were sledging on an ice-cap, not more than 2000 feet high, in a region where the ice was disturbed by no nunataks, while Odell made his observations on a normal glacier. But as these appear to be two unique glacial phenomena, I shall briefly describe the main points of the "canals," though I can offer no explanation for their existence.

We were sledging from the east coast to the west coast, and approximately in the centre of the island we traversed a region pitted with long lines of "canals" (or channels) in the ice. These channels ran from north to south, as far as the eye could see. They ranged in breadth between 30 feet and 100 feet. In most places they were bridged over or chocked up with hard congealed snow, which was concave and sagged below either lip of the channel. Invariably we found small crevasses on either side of the central mass of snow, not more than 3 feet across and usually bridged with soft snow.

In some places the whole channel was exposed, there being no snow bridge or chock. We looked down into a chasm some 40 feet deep. Its base was a mass of congealed snow in a chaotic condition. Nordenskiold describes how during his journey the party camped in these channels. It would have been quite impossible to pitch a tent on any of the open parts of the channels which we observed. We were two days in this region, in thick fog and snow.

The PRESIDENT: It only remains for me to express to Mr. Odell the gratitude of this audience for the trouble which he has taken in putting before us the results of his observations. He has given possible explanations of the mass of ice on the North Col, and also the trough in the East Rongbuk Glacier. I was a little disappointed that he was unable to offer any explanation of

those amazing sheets of fluted snow which are such an outstanding feature of the mountains in that part of the world. I have often gazed upon these vast walls of fluted snow with feelings of astonished admiration, and I had always understood that the most likely explanation was the falling of matter from higher ground, but I understand that Mr. Odell says that that is not a possible explanation, though he is unable to offer any explanation in its place.

Mr. N. E. ODELL: I think in the majority of instances there does not seem to be sufficient evidence of, say, a cornice above to give the effect of a scouring of the face in that way by avalanches. The flutings seemed to be present where such conditions were non-existent.

The PRESIDENT: At any rate, Mr. Odell has given us an enormous amount of information this afternoon, and a great deal of material which will certainly be of profound interest to geologists. I should like to express to him our deep gratitude for the trouble which he has taken, and the thanks of this audience I accord to him on your behalf.

RACIAL MIGRATIONS IN THE BALKANS DURING THE YEARS 1912–1924

A. A. Pallis

DURING the last twelve years the Balkan Peninsula and in particular the provinces which changed hands as the result of the Balkan Wars of 1912–1913 and the Great War of 1914–1918, namely, Macedonia and Thrace, have witnessed mass-movements of whole populations on a scale which can hardly be paralleled, unless we go back to the period of great racial migrations which coincided with the break-up of the Roman Empire.

These mass-movements were, partly, the result of direct warlike operations, such as the flight of the Moslem population of Eastern Thrace during the advance of the Bulgarian army up to the lines of Chataldja in October 1912, the flight of the Bulgarian population of Central Macedonia before the advancing Greek army in June 1913, and the flight of the Greek population of Western Asia Minor and Eastern Thrace following on the Turkish victory in Anatolia in August 1922; partly the result of political reprisals and persecutions, such as the expulsion of the Greek population of Western Thrace in 1913, the expulsion of the Greeks of the Thracian and the Anatolian littoral by the Young Turkish Government in 1914, and the wholesale deportations of the Greeks and Armenians of Eastern Thrace, the Marmara, and Pontus to the interior of Anatolia in 1915–1916; partly the consequence of voluntary emigration following on the transfer of territories, such as the emigration of the Greeks of Monastir, Gevgeli, and Strumitsa and of the Moslems of the Macedonian districts ceded to the Balkan Allies in 1913–1914; partly the result of formal agreements for the exchange of populations between

AUTHORITIES

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2. 'Census of the Kingdom of Greece taken on 19 December 1920.' Athens: National Printing Press, 1921.
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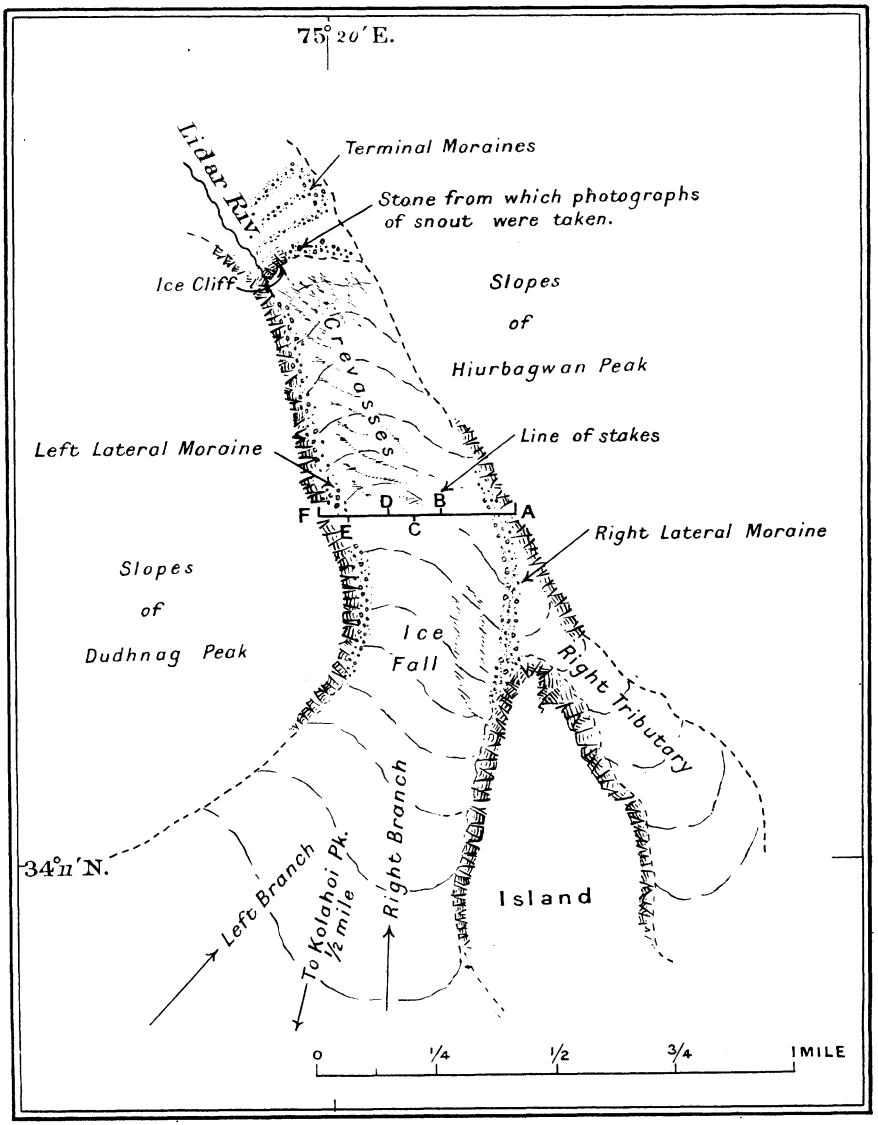
5. Giovanni Amadori Virgilj, 'La Questione Rumeliota.' Bitonto, 1908.
6. Alex. Antoniades, 'Le développement économique de la Thrace.' Athens, 1922.
7. Statistics of
   (*a*) the Mixed Commission for the exchange of populations between Greece and Turkey; and
   (*b*) Mixed Commission for Greco-Bulgarian emigration.

Athens, 1925.

THE MOVEMENTS OF INDIAN GLACIERS

WE have received from Sergt. A. Coleman, Army Education Corps, an account of his marking of the Kolahoi glacier, Kashmir, with a number of photographs. With a party of four natives, he visited the glacier in June 1923. The snow in the mountains was then unusually low, and the glacier was covered to a depth of 3 to 4 feet, the only indications of its existence being at the upper ice-fall. Sergt. Coleman made no attempt to survey the glacier, but based his sketch-map upon the 1″ Survey of India, sheet No. 43, N/8, 1915. Two of his photographs, taken from a large flat-topped boulder 20 yards in advance of the eastern end of the ice cliff, give a general idea of the glacier. That showing the ice cave and the issuing streams of the Lidar should be useful in estimating the retrocession of the snout, as the large boulder is easily recognizable. The birch tree on the top of the knoll in the centre was on a bearing of 244° T.B. from this boulder. In marking the glacier, he intended to place five stakes across the main stream below the ice-fall, but the depth of snow and the shortness of his visit curtailed his plans. He chose two easily recognizable natural marks on either side: drawings of which are reproduced here. The mark on the right bank (A) is a deep almost vertical cleft in the rock, just north of the junction with the east tributary glacier. The south side of this mark was used. The photograph was taken from the right lateral moraine. The mark on the left bank (F) is a black, shallow, almost vertical, cleft in the rock wall below a solitary birch, bearing 272·2° T.B. from A. The distance between these marks is 2410 feet. On the left lateral moraine he set up a cairn (E) which he intended to be in line with these two marks, but through magnetic influence on the compass, it was placed too far south,

bearing 271½° T.B. from A. Three stakes, each about 7 feet long, were placed at intervals across the glacier in line with A and the cairn. Two other posts were dragged into approximate position, but were not set up. A very rough measurement would prevent their being mistaken



Sketch-map of the Kolahoi Glacier, showing Line of Stakes.

for fallen posts. They are next to point A and the cairn respectively. Sergt. Coleman has deposited copies of his report and photographs with various bodies, including the Geological Survey of India. Kolahoi glacier is in an accessible part of Kashmir, and subsequent observations

will afford evidence of the fluctuation of Himalayan glaciers. We would be glad to receive further details from subsequent visitors to the Kolahoi glacier on this point. Dr. E. F. Neve stated in the *Alpine Journal* (25, (1910), p. 40) that from his own knowledge the Kolahoi between 1887–1909 had receded quite a quarter of a mile. He further estimated, from a study of the Trigonometrical Survey map of 1857, that it had probably retreated more than a mile in the succeeding fifty-two years.

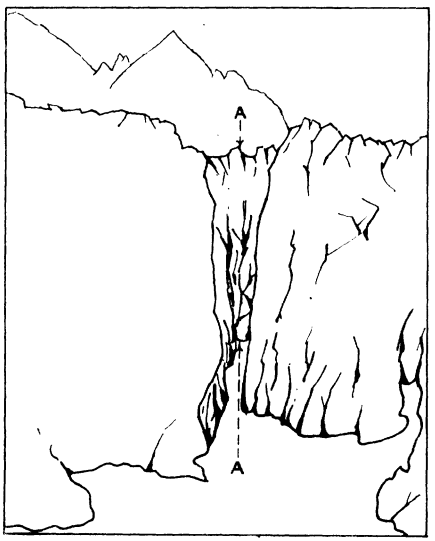
Sergt. Coleman has therefore carried out a commendable piece of work, and it is to be hoped that his example will be followed by others. The value of such observations in the Himalayas has long been appreciated. In 1905 Mr. D. W. Freshfield, on behalf of the Commission International des Glaciers, brought the matter to the notice of Sir S. G. Burrard, by whom it was referred to a sub-committee of the Board of Scientific Advice, consisting of Col. F. B. Long, Dr. G. T. Walker, and Sir T. H. Holland. The sub-committee drew up a scheme of observations and recommended that it should be carried out under the direction of the Geological Survey Department. The first results were published in 1907 in the *Records of the Geological Survey of India* (35, 127–57).

The reports contain a brief general description of each glacier, evidence of recent fluctuation, and an account of its demarcation illustrated with plates and sketch-maps. Altogether twelve glaciers were examined. In the Kashmir region, six were surveyed and marked by H. H. Hayden. Of the Barche and Hinarche glaciers in the Bagrot valley, he reported that the former had retreated comparatively recently, though whether this was truly secular or merely seasonal fluctuation was doubtful. The second appeared to have advanced since Sir Martin Conway's visit in 1892 : the natives spoke of periodic six-year cycles of fluctuation. He also examined three in Nagir State. The total amount of the retreat of the Minipin glacier in historical times appeared to have been considerable : at the moment of his visit it was advancing slightly. The Hispar glacier had also retreated in fairly recent times. Conway in 1892 thought it practically stationary, but since then it had retreated, though not more than a few hundred yards. Two years after Hayden had marked this glacier, further observations were made by Dr. Calciati on the Workman expedition. During that interval it had retreated about 12 metres. The Yengusta glacier was of particular interest, as about 1902 it had suddenly advanced about 2 miles. It was also examined by Calciati in 1908, and found to have retreated about 98·6 feet since 1906 : this may have been merely summer contraction. The Hassanabad glacier is another example of recent rapid advance : about 1904 it advanced a distance variously computed to be from 6 miles to one day's march. It was examined by Dr. Workman in 1908 ; from Hayden's data he concluded that it had not moved in the interval.

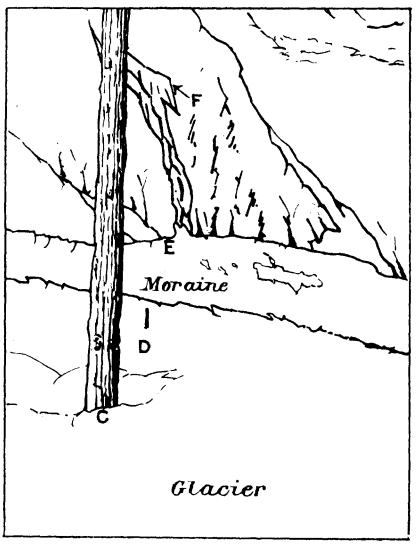
In Lahaul Messrs. H. Walker and E. H. Pascoe examined and marked two glaciers, Bara Shigri and Sonapani. Both showed signs of retreat. The

remaining four, in Kumaon, the Pindari Milam, Shan Kulpa, and Poting, were visited by Messrs. G. de P. Cotter and J. C. Brown. In all cases, except perhaps the last, local tradition recorded a recent retreat: of the first, J. W. A. Mitchell wrote in 1894 that it appeared to have retreated about 100 yards in the previous ten years; according to "A. K." the second had retired 800 yards in fifty-seven years, and a slight retreat of the third was also recorded. The Poting glacier was apparently stationary, as the terminal moraines in front of it did not look recent. It was examined five years later by Captain Grinlinton, who found the snout was in approximately the same position as in 1906.

In 1909 two glaciers in Sikkim, the Alukthang and Zemu, were marked by Mr. T. H. D. la Touche (*Records Geolog. Survey, India*, 40,



Mark A on right of Glacier.



Marks C, D, E, and F.

52–62). Neither appeared to have moved since Mr. Freshfield's visit in 1899; though from the evidence of Major Sherwill the first may have retreated half a mile since 1861. Captain (now Major) Grinlinton, in September 1912, also examined six glaciers in Kumaon—the Sona, Baling, Naulphu, Nipchungkang, Kharsa, and Chingchingmauri glaciers. His account (in *Records Geolog. Survey, India*, 44, 280–335) gives details of the position of the snouts. We understand that he has since made further observations, and it is to be hoped that these will be published in due course.

The details of the markings of these glaciers were obtained from the *Records Geological Survey of India*, for the years 1907 to 1914. As no further information on the subject has been published in the *Records*, it would appear that this important work has been abandoned, at least for the present. It is to be hoped that circumstances will permit its speedy resumption.

LORD CURZON'S POSTHUMOUS WORK ON INDIA

British Government in India. The Story of the Viceroys and Government Houses.— The Marquis Curzon of Kedleston, K.G. 2 vols. London, etc. : Cassell & Co. [1925.] $11\frac{1}{2} \times 8\frac{3}{4}$, pp. xx. + 260, x. + 268. *Portraits and Illustrations.* £3 3*s. net.*

UNDER the title 'British Government in India' Lord Curzon discourses in two sumptuous volumes on many men and matters associated with a century and a half of British rule over that continent. The work was intended by its author to be—and the reader will assuredly decide that the intention has been splendidly fulfilled—both the payment of a debt to Calcutta and a tribute to the memories of the great office of Viceroy and to the undying magic of India and its people. Though many interesting side-lights are thrown by it upon history, the book does not purport to be an historical work. It can best be described, perhaps, as a canvas on which is depicted the manner of life of an Indian Viceroy, with special attention paid to the background against which the drama of Indian Vice-regal life is played. Indeed, the book as originally conceived was to have been a history of Government House, Calcutta, " that stately building by far the finest Government House in the Empire," for which posterity is indebted to the imagination and imperious temper of Lord Wellesley, who, a century and a quarter ago, determined on and accomplished the building of it without the permission, or even the knowledge, of his employers, the directors of the East India Company in London. The first volume is dominated by the original idea, and nearly the whole of it is devoted to an elaborate drawing of the background of the picture.

Incidentally, as we study the painting, we obtain many interesting glimpses of the personality of the artist. One of Lord Curzon's outstanding characteristics—his industry and thoroughness—is immediately apparent. When he took up a subject he could not rest until he had probed it to the bottom. Hence we find two chapters given up to a laborious examination of the claims of a large number of buildings in various parts of Calcutta to have served either as Government Houses or as Council Houses, before Lord Wellesley's palace came into being. However valuable these pages may be to the student concerned with the *minutiæ* of history, they will be likely to excite the admiration of the general reader for the industry and critical ability of their author rather than his interest in their actual subject-matter. Thereafter we come to the central feature of the background, to the history of which and to whose exterior and interior features—its grounds, its marble halls, its pictures, and its furniture —more than one-third of the first volume is dedicated. The well-known resemblance of the building to Lord Curzon's own home in Derbyshire is naturally dwelt on, and the part which this coincidence played in shaping his own career is admitted. " Perhaps it may be regarded as an illustration of the small points on which even the larger issues of life depend, that it was the alleged correspondence of the two houses that first turned my attention, when a boy, to India, and planted in me the ambition from an early age to pass from a Kedleston in Derbyshire to a Kedleston in Bengal."

The author gives a detailed description of the rooms of Government House which will recall many memories to those who are familiar with the building, and will give an adequate idea of its size and magnificence to those who are not. With consummate skill he displays one by one before the reader's eyes sketches drawn with extraordinary fidelity of its historic chambers—of the great pillared hall and throne room in the body of the building, of the council chamber in the north-east wing (south-east on p. 113 is an obvious slip), and of the great

room with the veranda in the south-west wing which has witnessed " discussions as agitated and decisions as heavily charged with fate as any private apartment within the wide circumference of the British Empire," and in which day after day " from 10 a.m., with the exception of an hour or two for meals or a public function, or a drive, until 2 a.m. on the following morning or sometimes later," Lord Curzon sat and laboured during the period of his own vice-royalty.

In the course of his narrative he demolishes some treasured traditions, notably, that which attributes the glittering array of chandeliers in the ballroom, and various other objects, to captures from the French and Dutch by British men-of-war. But if he plays the part of an iconoclast in the case of some cherished legends, he has made up for it by some notable additions to the amenity and adornment of Government House itself. One of the features of the interior decoration of the building is its series of cool grey marble floors. These have been added to from time to time. Lord Ripon extended the marble flooring of the throne room to the south veranda behind the throne. Lord Curzon, the better to display this feature of the building, removed the carpets which he found covering it in the throne room, and paved the central basement hall with the same material. " A Royal visit," he writes, " lends a tremendous and highly esteemed fillip to the furniture of Government Houses in all parts of the world." In recent times a Governor of Bengal was fortunate enough to find himself in a position to prove the truth of this *obiter dictum*, and in anticipation of the visit of H.R.H. the Prince of Wales to Calcutta in December 1921, was able to extend the marble flooring to the great segmental corridors leading from the central block to the wings, which he found covered with matting altogether out of keeping with their surroundings. Lord Curzon was at all times an outspoken critic of the transfer of the capital from Calcutta to Delhi, and he naturally laments the disappearance of the Governors-General from the historic setting in which, for more than a century, they had played their part. But he is, perhaps, inclined to write *ichabod* over the portals of the erstwhile seat of the Cæsars, in letters of unnecessary size. When writing of the ceremonial and social demands made upon a viceroy, he mentions a calculation made at his request, which showed that in the month of January—when the Calcutta season is at its height—the number of meals served in Government House in his time amounted to 3,500. It may be of interest, therefore, as showing that, even under the changed conditions which Lord Curzon so greatly deplored, Government House is still capable of living up in some measure to its past traditions, if mention be made of a calculation of a similar kind made twenty years later, which showed that in the month of December 1921 the actual number of bottles of champagne opened—and presumably drunk—within its precincts was one thousand one hundred and fifteen.

But if Government House is the centre, it is by no means the only object of importance in the background which Lord Curzon paints for us. In view of his well-known admiration for Warren Hastings and his charming consort—" the most remarkable man and not the least fascinating woman that ever trod the stage of Anglo-Indian life "—it is not surprising to find a chapter devoted to the numerous houses which from time to time they actually occupied, or were alleged to have occupied. Nor will those who respect and admire his passionate reverence for the historic monuments and buildings of the past cavil—on the ground of a certain incongruity—at the inclusion of a chapter on the " Black Hole " and its monument, around which no little controversy has hitherto raged. All, too, will be glad that he has placed on record an authoritative

account of the Victoria Memorial, " by far the finest structure that has been reared in India since the days of the Moghuls and the most splendid concrete monument of British rule," for the planning of which he was himself responsible. In it we do indeed see the magnificent realization of a brilliantly inspired conception ; and few of those who have gazed in silent wonder and admiration upon its glistening dome of pure white marble, rising from the centre of a vast and stately structure of the same material, will be disposed to deny that the building, with the collection which it houses, is a monument worthy of the great epoch whose memory it perpetuates.

When we turn to the second volume we find ourselves still occupied with the background on the canvas. This time it is the park and house at Barrackpore, the country residence first of the Governors-General and now of the Governors of Bengal, which stands on the left bank of the Hughli river 14 miles above Calcutta. And it is not until we have followed the vicissitudes of Lord Wellesley's grandiose project for a second great palace here, from its inception to its eventual completion on a far more modest scale than this autocratic servant of the East India Company intended ; and have been familiarized with the life led there by successive occupants ; and have visited the various objects of interest from the Hall of Fame to Lady Canning's tomb, and from the Eden School to the staff bungalows which cluster round it, that we come at last to the great living pageant which, with the buildings which have been so carefully depicted as its background, wends its way with due pomp and circumstance down the checkered flights of time. It is true, as Lord Curzon himself reminds us, that in the course of the narrative which he has been relating " we have, in one context or another, come across every occupant of the Governor-General's seat." But hitherto they have been incidental to the story rather than the subject of it. Now they come into their own, and it is here, perhaps, that Lord Curzon is in his happiest vein. One by one he lifts his puppets from the store in which the hand of Time has laid them, and with all the skill of the accomplished showman makes them dance before us. And as they dance we perceive what manner of men they were ; how they comported themselves in the environment to which they found themselves transported ; their strength and weaknesses ; their temperamental idiosyncrasies ; the moulds in which their respective characters were fashioned ; the varied sources of their failures and successes ; all those things, in short, that go to the making of human personality. This is what he does for us ; and this is precisely what it was that he set out to do, for, as he tells us, " it is no part of my object to condense the history of India under British rule into a single chapter, or to deal with wars and annexations, with economic or political developments and internal reforms." Such matters are scarcely touched on, and in their place we are given pen portraits of each link in turn of the long chain of Governors-General from " that great and demonic figure standing forth like a rock of granite against the tempestuous background of his time " * to the courtly figure of Lord Lansdowne, " who left in India, as in every office that he has filled, a reputation of the highest distinction." Here the palette and brush are laid aside, for we have reached a date too near to the present to permit him to continue painting with propriety.

Of Lord Curzon himself, as I have already said, we obtain many glimpses as the narrative unfolds. The place which India filled in his own life is apparent from the devotion and palpable delight with which the task of writing of her is

* Robert Lord Clive. Though the office of Governor-General had not been created in his time, he was twice Governor of Fort William in Bengal.

undertaken. Yet there appear at intervals throughout the book, passages of deep pathos in which are to be seen reflected all too plainly the anguish and bitterness of soul which cast so great a gloom over his own departure from her shores. He shows us, for example, each new Governor-General climbing the great stone stairway of Government House to assume charge of his glittering office—" all was then novelty, brave hopes, and high aspirations." And then he tells us of their going—" down them, a few years later, he walked, with feelings very often how different, into the cold dissecting chamber of history." Nor was life behind the bars of the gilded cage the bed of roses which a thoughtless public, blinded by the external glamour of the office, was too apt to suppose. " Amid the fanfare of trumpets and the thunder of the guns, Government House, Calcutta, has sheltered more than its quota of bruised hearts and broken hopes." That is not the least important of the lessons which he seeks to drive home. He would have us realize that " the government of India is not a pastime but an ordeal, not a pageant alone but as often a pain," and that " over the vice-regal throne there hangs not only a canopy of broidered gold, but a mist of human tears." As he compiles the tragic record of ill health —of " Warren Hastings habitually ailing " ; of " Minto's strength sapped " ; of Dalhousie's life " one of incessant and truly heroic combat with devouring and ever-increasing pain " ; of Canning " turned in a few years into a prematurely old man," there arise memories of those days of ill health and physical suffering with which Lord Curzon himself was too often visited. And when he tells of Warren Hastings compelled " to send his wife home in order to escape a breakdown in her health " ; of Sir John Shore " twice obliged to leave his wife behind " ; of the first Lady Minto who " from the day when her husband started for his great charge never saw him again until his body was carried into the gates of their Scottish home " ; and dilates upon the price which has to be paid " even in the desperate issues where the gates of life and death swing on their cruel hinges," we find ourselves standing with him on the brink of an open and premature grave in which but a few months after they had left the shores of India, the body of " the partner and main author of his happiness in India " was laid to rest. Such, indeed, is the price that has to be paid, and if one opens this book and peruses it with feelings of interest and delight, it is impossible to close it without a sob.

The book will surely live, and it is incumbent upon a reviewer, consequently, to point to any slips that he may have detected in it. On p. 107, vol. **1,** Lord Curzon refers to a picture of Fath Ali, Shah of Persia 1798–1834, and says that it must have been brought to India by one of the Indian missions that were despatched to the Persian Court in the early years of the eighteenth century. Eighteenth should presumably be nineteenth. On p. 113 of the same volume, " south-east wing " should be " north-east wing." On p. 139 of vol. **2,** occurs a curious error. " It has always struck me as an astonishing thing," writes Lord Curzon, " that the enthusiasm of the Bengalis for Lord Ripon . . . should never have taken the concrete form of raising the funds to erect a statue in his honour. Even if the chill attitude of the European community had denied to him the hospitality of the Maidan, it might have been thought that some other site would be forthcoming. But the gap remains unfilled." This is incorrect. There is in Calcutta a statue of Lord Ripon subscribed for by Bengali money. Nor was it denied the hospitality of the Maidan, for it stands in the company of Lord Lansdowne and Lord Minto on the side of the great red road which runs from the neighbourhood of Government House across the Maidan in the direction of the Victoria Memorial.

R.

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THE ALPS OF QUNGUR

C. P. Skrine, I.C.S.

Read at the Meeting of the Society, 27 April 1925. Map follows page 480.

IN January 1922 I was fortunate enough to be appointed to the officiating charge of the British Consulate-General at Kashgar, and proceeded at once to make arrangements for the journey of my wife and myself to that ancient city by the Srinagar–Gilgit route. One of my first proceedings was to go to Delhi and consult Sir Aurel Stein as to whether there was anything I could do, in however small a way, to supplement his great explorations in Chinese Turkistan. Hearing I was going by the Gilgit–Tashqurghan route he at once suggested my trying to go down the Qaratash valley and examine the eastern face of the Qungur massif, which no one had as yet seen, and particularly its south-eastern offshoot, the Shiwakte Mountains. He himself, he told me, had in September 1913 been the first traveller to cross the Buramsal pass and follow the Qaratash river to its debouchure 36 miles due south of Kashgar; but owing to shortage of time, lack of supplies, and the extreme difficulty of the Qaratash gorges he had been unable to ascend any of the side valleys coming down from the Shiwakte and Qungur, and had had to confine himself to a plane-table traverse of the main Qaratash gorge. The latter is so deep and perpendicular-sided that he caught no glimpse from it of the main range to the west. This was quite enough to decide me to explore those side valleys of the Qaratash at all costs, and accordingly in April, before proceeding to Srinagar, I went to the headquarters of the Survey of India at Dehra Dun and invoked the aid of the Superintendent, Col. Cowie, and his assistant, Major Perry.

I may mention here that my sole qualification for survey work in unexplored mountain regions was having undergone nine years previously a short course of land records training in the United Provinces, during which another budding civilian and I had co-operated in a plane-table survey of a nine-hole golf-course near Cawnpore. None the less, the Survey officers were as kind and encouraging as could be, not only

lending me a complete plane-tabling outfit, but spending valuable time in coaching me for two days in the rudiments of field survey work. Col. Cowie agreed with Sir A. Stein that the blank patches in Survey of India Sheet 42 N (serial No. 2 of Stein's half-million-scale maps of Chinese Turkistan and Kansu), that is to say between the 75th and the 76th meridians and the 38th and 39th parallels of latitude, would be well worth my while trying to visit on the way to Kashgar.

The Drawing Office happened at the time of my visit to be engaged on the very sheet in question, an advance copy of which was specially heliozincographed on to cardboard for use on a plane-table. This map shows clearly the two great massifs of Qungur and Muz Tagh Ata, which are the twin culminating points of the meridional range, usually known as the Kashgar Range, which connects the westernmost Kunlun with the Tien Shan in the north and forms the eastern rim of the Pamir region.

For many years great uncertainty existed as to the height of the two massifs and even as to the identity of the northern one, which is visible (though only rarely) from Kashgar. This massif was fixed by Trotter in 1873–4 under the name "Tagharma." Sven Hedin and the Russian cartographers regarded Muz Tagh Ata as higher than its northern rival, Qungur, but do not appear to have given any height for the latter. Capt. Trotter's value for it was 25,350 feet. According to the Survey of India Triangulation Pamphlet on Sheet No. 42 N :

"Deasy, in 1899, measured a base of 6 miles at Kashgar, observed Kungur, and obtained a height of 23,350 feet for it, or 870 feet lower than Muztagh-ata (*Geographical Journal*, XVI., 1900, p. 521). In 1900–01 Stein obtained two values for Kungur, viz. 23,600 feet and 25,146 feet * ; the former value was at first adopted and is shown on his map of the expedition. Subsequently the agreement of his higher value, 25,146, with Trotter's value, led to the adoption by the Survey of India of this value, and Stein's map after his 1906–08 expedition shows two summits, 25,046 feet and 25,146 feet, in this neighbourhood. Great uncertainty therefore still exists as to the heights of the summits of this massif, and Kungur II. (25,046) previously accepted by the S. of I., has now been deleted."

The telepanoramas exhibited in the lecture show the two summits clearly, Qungur II. on the left and Qungur I. on the right. I am glad to say that one of the results of my amateur efforts has been to enable the Survey of India to fix with some exactitude the position of Qungur II. and to calculate its height provisionally as 25,200 feet, or slightly higher than Qungur I.†

* *I.e.* for Qungur II. and Qungur I. respectively.

† See Major K. Mason's 'Notes on the Compilation of Mr. C. P. Skrine's Topographical Material in the Neighbourhood of the Qungur Massif,' Appendix I., para. 7 *ad fin.*

In order to gain access to the eastern flanks of the Qungur massif and of the mysterious range to the south-east of it named by Stein (from the Pamirs side) the Shiwakte, it was necessary for us to penetrate the gorges of the Qaratash river mentioned above as having been traversed by Stein alone among previous travellers. The upper waters indeed of this river are comparatively accessible, for there is a route, used occasionally by Afghan opium smugglers, which goes from Qara Köl over the Qaratash Pass (16,338 feet) into the valley of that name and out of it again by the Ghijaq Pass to Ighiz Yar and the plains. But this route only traverses a stretch of about 6 miles of the main valley, and that not an interesting one; the difficult part is lower down, from Chimghan Ayaki to Khan Terek. The first attempt to force these gorges was in 1906, when Stein detailed Ram Singh to try and reach Kashgar by this route.* Ram Singh crossed the Buramsal Pass † and descended the Qaratash as far as the main gorges, but was unable owing to the volume of water to go further and to cross the Ghijak Pass and rejoin the ordinary Kashgar road at Ighiz Yar.

It was not till Stein's third expedition, in September 1913, that the Qaratash valley was traversed throughout by Stein himself. He describes his journey as follows:

"I myself set out for the same goal (Kāshgar) with Muhammad Yakub by a new route leading due northwards across the Merki pass and down the valley of the Qaratash or Beshkan river. Owing to special difficulties this important valley, in which most of the eastern drainage of the great glacier-clad range of Muz-tagh-ata finds its way into the plains between Yangi-hissar and Kāshgar, had never been explored in its whole length. During spring and summer the big floods from the melting snow and ice of the range render the extremely narrow gorges of the Karatash river in the north quite impassable. By the time the waters subside in the autumn, heavy snow on the Merki and Kara-tash passes closes the approach from the south. In the spring of 1906 I had sent Ram Singh to descend the valley, but the flooded river had obliged him to abandon the attempt. We were more fortunate this time. Exceptionally early snowfalls had stopped the melting of the glaciers just in time to allow of a passage while the Buramsal pass (14,940 feet), though under deep snow, could still be traversed with laden yaks. Nevertheless the descent through the extremely confined gorges of the river below Chimghan proved very difficult and in places risky. The constant crossings of the river tossing between precipitous rock walls could not have been effected without the help of hardy local camels secured from Kirghiz camps higher up the valley" ('Memoir on Maps of Chinese Turkistan and Kansu,' p. 25).

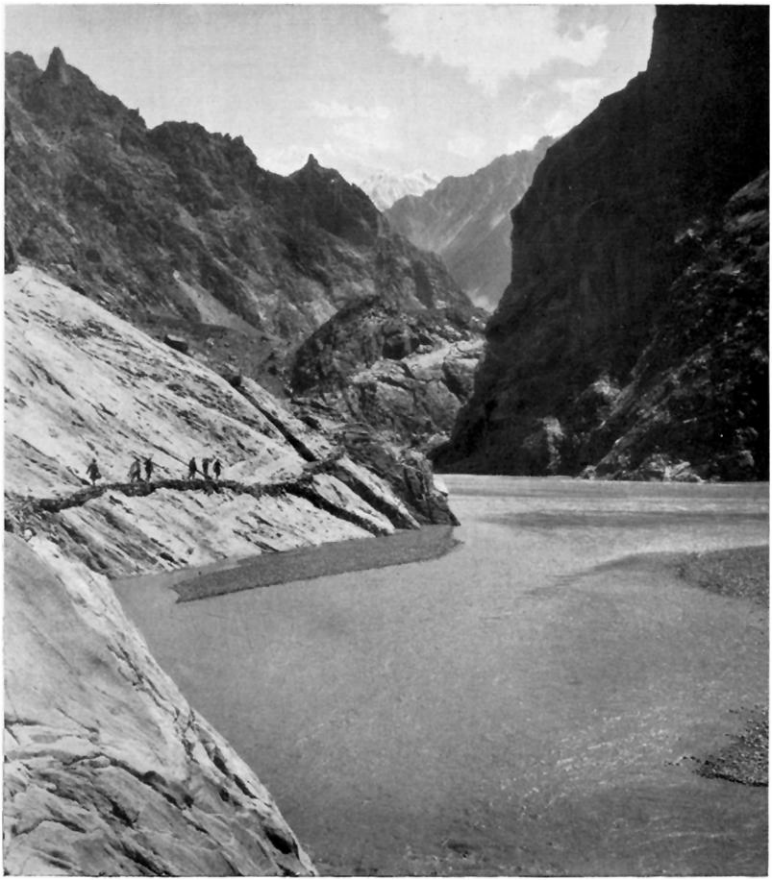
* 'Memoir on Maps of Chinese Turkistan and Kansu,' p. 11.

† The pass crossed by Ram Singh on this occasion was probably the Buramsal, not the Merki pass, as stated in the Memoir.

Leaving Srinagar on 3 June 1922, my wife and I and a friend, Mr. G. C. Price, travelled up *viâ* Gilgit and the Mintaka Pass to Tashqurghan, which we reached on July 6, and halted there a couple of days. Thence taking the ordinary summer route to Kashgar, we crossed the southernmost slopes of the Muz Tagh Ata massif and camped on the Chichiklik or " flowery " plateau at a height of about 15,000 feet. To the east of this, the route followed by Stein on both his journeys, and by most travellers on this road, goes straight down to Toile Bulung in the Pasrobat valley by the Tangitar gorge, in which the going is notoriously bad during the high-water season. In order to avoid it and also to strike less-known ground I decided to cross the Yangi Davan to the north of Chichiklik and go down the Yambulaq Jilgha. The pass (16,100 feet) proved easy, though the snow lay deep on the north side and it was necessary to lead the ponies down carefully. We were interested to find, lapped among the snowy peaks at the head of the Yambulaq Jilgha, 15,000 feet above the sea, a beautiful lake about $1\frac{1}{2}$ miles long by $\frac{1}{2}$ mile broad, still partly covered by the ice of winter. This lake is not marked in the Survey of India map, nor is it mentioned by any of the authorities I have read. We halted for a couple of nights at the hospitable camp of the Yambulaq Qirghiz about halfway down the valley, my object being to reconnoitre the Merki pass and see if it would be possible to take our caravan over into the upper Qaratash valley. I knew it would not be possible to go down through the gorges, but I thought of halting two or three days in the upper part of the valley, exploring the Chimghan Jilgha which promised easy access to the Shiwakte, and then rejoining the ordinary Kashgar road by the Ghijaq Pass route. Accordingly on July 12 Price and I started for the Merki Pass with five yaks and three sturdy Qirghiz. To cut a long story short, we found the " pass " not to be a real pass at all, nothing but a lofty ridge of rock at least 17,000 feet high, deep in snow even on the south side and defended also by an apparently perpendicular wall of ice. After five hours of scrambling up among enormous boulders and through soft snow in which the yaks often floundered helplessly, we left the animals and climbed on foot to the summit of a spur, 16,500 feet high, which commanded a good view of the " pass " above us to the north, and of a vast expanse of tumbled mountains to the south and west. Muz Tagh Ata and Qungur were unfortunately buried in clouds—as I was to find out later, it is useless to try to get a view of the giants after about ten o'clock—but the little-known peaks of the upper Yarkand River valley stood up grandly to the south. We were interested to observe two more lakes, one a small tarn immediately below us to the north-west, the other a large sheet of water on the opposite (south) side of the Yambulaq Jilgha, lying at an elevation of about 1000 feet above the valley-bottom. We thus found altogether three lakes in the catchment area of the Yambulaq Jilgha ; there are two small tarns also on the Chichiklik plateau. The upper Yambulaq

CASTLE OF THE MIR OF HUNZA, BALTIT

NANGA PARBAT FROM BUNJI



IN THE HUNZA GORGES

valley, in fact, together with the Chichiklik Maidan and the rolling hills in the neighbourhood, constitutes a piece of typical Pamir country, lakes and all, on the east side of the meridional range; the only such region to be found surviving, as it were, among the peripheral gorges south of the Gez Dara.

From our reconnaissance it was clear that the Merki "pass" was quite impracticable for loaded animals; the Qirghiz indeed told us that it was hardly ever used, even by them. The only thing to do, therefore, if we wanted to reach the upper Qaratash Valley, was to go down to Toile Bulung and over the Buramsal Pass. This would have entailed three extra marches and trying ones at that, so, as time was short and the Qirghiz also frightened us with accounts of the volume of water in the upper Qaratash valley, I decided to abandon for the time being my attempt to reach Chimghan and the Shiwakte. Crossing the Tari Art (13,340 feet) and Kashka Su (12,900 feet) passes without difficulty, we at last, on July 18, emerged from the mountains at Ighiz Yar and reached Kashgar three days later. I shall never forget the view of the snows of the Kashgar range which we saw as we crossed the fertile plains of the Yangi Hissar and Kashgar districts; all the great massifs with their lesser satellites were clearly visible for a hundred miles or more to the south and west. I did not know then how rare this beautiful spectacle is, and it was not till May 1923, ten months later, that I succeeded in obtaining a good telepanorama.

On 11 October 1922 we left Kashgar on a two-and-a-half-months' tour on Consular duty to Yarkand, Khotan, and Keriya. Instead of going straight to Yarkand, however, we turned off the main road at Yapchan and marched *viâ* Akhtur Bazar, a picturesque village with a large ruined fortress on the banks of the Qaratash river (here wide and shallow as it flowed over the plain) to Altunluk, at the debouchure of the same river from the foothills of the Kashgar range. We were accompanied by a member of the small colony of "White" Russians at Kashgar, Mr. Paul Nazaroff, a mining geologist well known at Tashkend before the Revolution. Our baggage and unmounted retinue went on seven shaggy two-humped "Bactrian" camels, for the hire of each of which we paid the princely sum of *2s. 4d.* a day. The Chinese magistrate of Yangi Hissar, with whom we had made great friends on our way to Kashgar in July, gave us all the assistance in his power and sent with us the Beg of the valleys for which we were bound, an excellent old man who, unlike some others of his kind we have met, always did his best for us and gave us no trouble whatever.

The people of Altunluk, where we camped in a pleasant orchard gay with autumn tints, did all they could to dissuade us from venturing up the Qaratash Valley, but had to admit that the season was well advanced and the summer floods lessening. Whenever one leaves the beaten track the local people, usually backed up and sometimes in-

stigated by their Beg, invariably take this line, so that if anything untoward happens they can say, "We told you so." This is the more necessary from their point of view in that the Chinese always come down heavily on the Beg concerned if anything happens to a foreigner when travelling in the districts, and the Beg of course takes it out of the local people.

Accordingly, on October 14 we started up the right bank of the Qaratash, which here flows in a wide valley between low barren hills. Fording the river without difficulty 8 miles above Altunluk, we continued for 9 miles along the left bank among gradually rising but bare and much-eroded foothills. The river had then to be crossed and recrossed at a point where it breaks through a transverse ridge of red sandstone about 9000 feet high, forming narrows through which the water rushes with some force. The maximum depth at the fords above and below the narrows was 4 feet and the current about 5 miles per hour, while the stream was roughly 30 yards broad. A wide and almost straight reach of the Qaratash some 5 miles long was now entered, and a mile farther up we came to the first signs of occupation by the Qirghiz of the mountains at Saman. Here there were two tumbledown crofts and a few acres of land which had once been under the plough, now deserted, and here also we found a pleasant little grove of planes and desert poplars (*P. varifolia*). We camped here for the night and proceeded up the left bank next day. This morning for the first time the dust haze, which throughout the Tarim basin is the bane alike of the surveyor and of the landscape photographer, began to disappear, and we saw dimly, rising grandly above the river valley straight in front of us, a magnificent snow-peak which we afterwards found to be the outermost aiguille of the Shiwakte, Kök Dŏng, 16,800 feet high. A mile or two above Saman this peak was hidden by the nearer hills which rise steeply 3000–4000 feet above the valley bottom, here some 6000 feet above the sea. They consist of much-decayed grey limestone with, at one point, a well-defined belt of red sandstone, and are a continuation of the Zor Qir ridge which encloses the Yapchan valley on the north. The Qaratash makes a right-angled bend as it cuts through this ridge at the narrows of Achiq Aghzi. Another wide reach some 4 miles long, in which the river runs south-east to north-west, is here entered; there must have been a lake here before the river cut through the above-mentioned ridge, for three different "raised beaches," one above the other, are plainly visible on the hillsides above the right bank.

At the upper end of the narrows there is a Qirghiz bridge of primitive cantilever type leading to a plot of 40 or 50 acres on the right bank with two tiny farmsteads, all the irrigation of which is done from a wooden aqueduct carried high over the bridge. On the left bank is a pleasant little apricot orchard with a mud-brick farmstead attached, called Qurghan (fortress), from a small tower the remains of which can still be seen. The valley just above here is at its widest, and a comparatively large plot

of ground is cultivated with barley and lucerne; the place is the winter headquarters of the Qirghiz of the Chopqana Jilgha, one or two of whose huts * are usually to be found here even in summer. At this our first visit the place was deserted; as we afterwards found out, the Qirghiz, alarmed at the approach of a large cavalcade, had fled with their flocks and herds up to their highest fastnesses. On our return journey, however, and on each subsequent occasion that we passed this spot, the Chopqana Qirghiz always had a hut and some food ready for us, and some of them, men and women, were usually there to receive us.

A mile above Qurghan, we crossed once more to the right bank; it was the last easy ford we were to have, for 5 miles further up the valley suddenly narrowed and we found ourselves entering the gloomy portals of the dreaded gorges which only Stein had penetrated before us and about which he had spoken so feelingly.

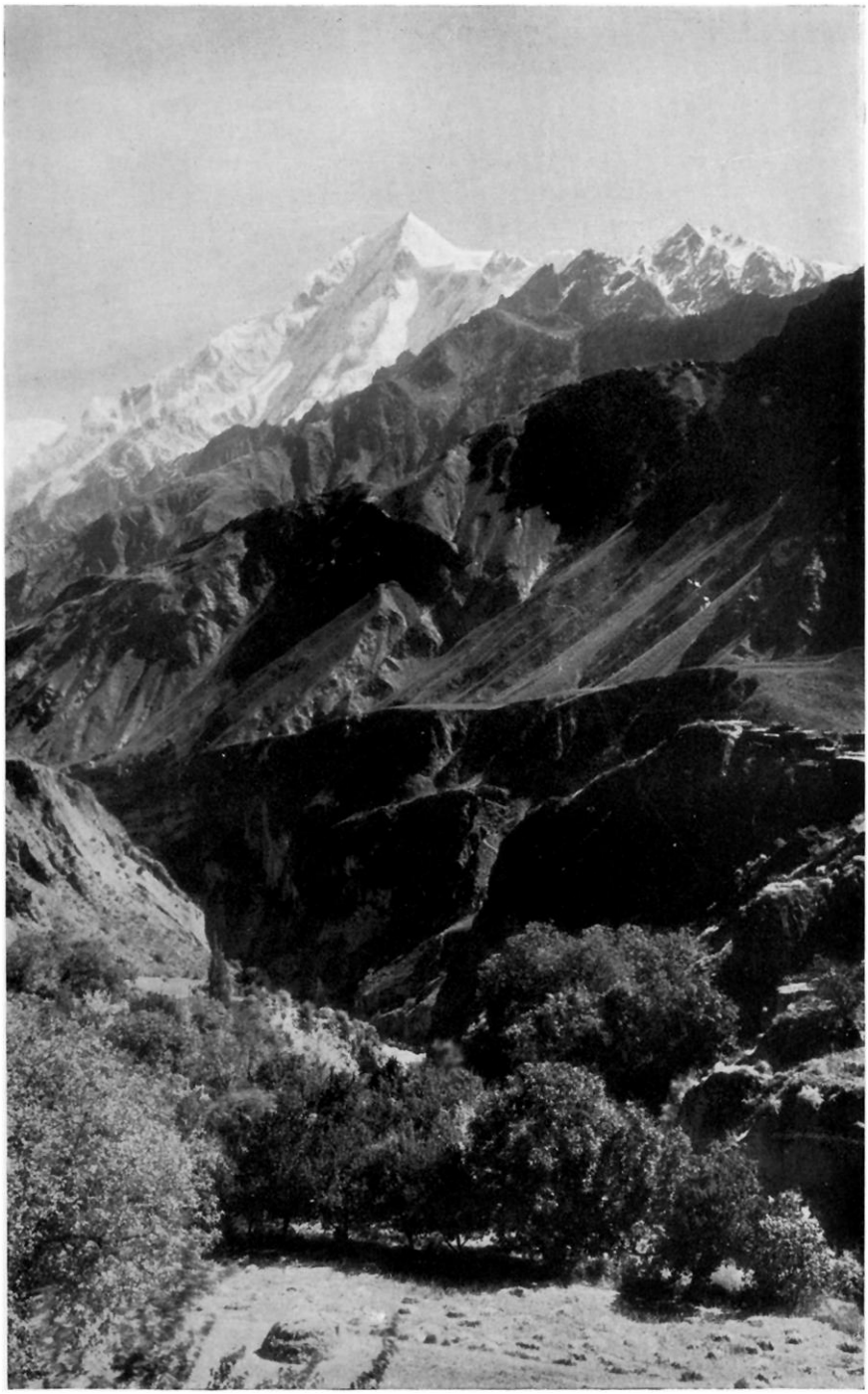
We had to cross the stream nine times in the next 3 miles, and although there were no rapids and the river-bed was in every case comparatively smooth, the fords were none of them easy to cross on horseback. Our baggage-camels had no difficulty, their extra length of leg giving them an advantage over the horses. Stein, it will be remembered, used local camels when he came down through the gorges three weeks earlier in the year ('Memoir,' p. 25). Even so most of our baggage got wet.

At Bash Kupruk ("Bridge-head"), where there used to be a bridge giving access in summer from upstream to the valleys on the right bank, the gorge widens somewhat, and we pitched our tents in a grove of tamarisk and willow which gave us welcome shelter from the icy wind. Firewood was plentiful, we had a week's supplies with us, and there was good grazing for the camels, so we decided to halt for a day or two and give the animals a rest. The gorge, we were told, was much narrower and the stream quite unfordable further on, and it seemed advisable to reconnoitre before attempting a further advance. A mile ahead I noticed a spur coming down from the west, the direction of Qungur, which seemed distinctly less unscalable than the rest. Sending one of our orderlies with a Qirghiz guide up the main gorge to report on the state of the water and the possibility of getting through to Chimghan, I myself set up the plane-table first at the mouth of the Kaying Jilgha, and then 2000 feet up the ridge to the south-west, at a point which I fixed from below and marked with a cairn (Stn. I.). From this point I obtained a tantalizing though still rather hazy view of snow-clad peaks not more than 7 or 8 miles away to the west, apparently enclosing the head of the Kaying Jilgha. Below me the Kaying stream rushed

* The Qirghiz nomad hut, known in Kashgaria as *aq-oi* or "white house" from the grey felts used, consists of a collapsible circular lattice framework of wood covered with large felt mats, with an aperture in the top which acts as chimney and window by day and can be covered with a mat by night to keep the warmth in. The word *yurt* used for these huts in Russian Central Asia means "village" in Kashgaria. The Tajiks of the Pamirs have copied the Qirghiz nomad hut, which they call Khirga.

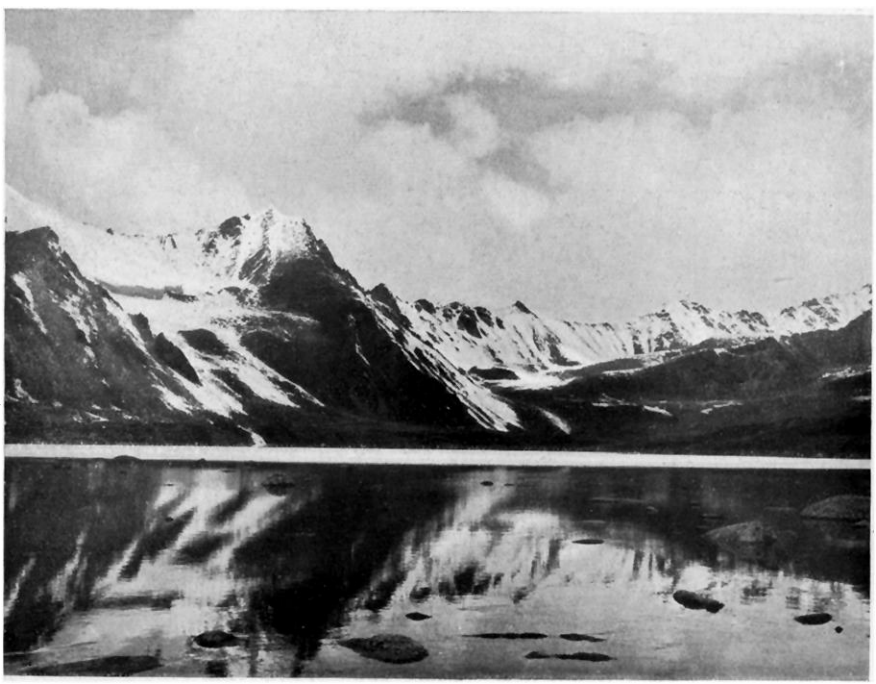
through a rocky but by no means impassable gorge ; while right opposite me to the north-west rose a high double-peaked mass of dark grey limestone which I identified as " Kaying-beli," the last peak shown in this direction on Stein's map. Though exceedingly steep and even precipitous, I thought I could climb this peak, from which it appeared almost certain that I would obtain the longed-for view of the east face of Qungur and maybe of the mysterious Shiwakte (about which my guide could tell me nothing) ; so I fixed both the points of Kaying Beli carefully and decided to try and climb it next day from the same camp. I also drew rays to as many of the peaks of the Qaratumush and Pitlik Jilghas as I could ; the further course of the main Qaratash river was invisible, for the stream seemed to issue from under a great rocky wall about 10,000 feet high.

I was disappointed but not surprised when the orderly whom I had sent up the main gorge to reconnoitre reported late that evening that further up it became so narrow and the current so deep and strong that there was no hope of our getting through to the mouth of the Chimghan Jilgha with the whole of our caravan, if at all. I had no intention of risking the lives of members of our party or of our animals in the raging waters of the Qaratash, so once more I reluctantly decided to give up the attempt to approach the Shiwakte *viâ* the Chimghan Jilgha, and to explore instead the Kaying valley and see whether there was a pass at its head giving access to the eastern foot of Qungur. Accordingly, next day at 7 a.m. I started out with plane-table and camera to climb Kaying Beli, accompanied by a Qirghiz guide and the best cragsman among my orderlies, an excellent young Hunza man of splendid physique called Sangi Khan. Striking up the Kaying Jilgha a mile above camp we followed the stream for another 2 miles to the mouth of a steeply pitched ravine, 7800 feet above the sea, from which we climbed straight up in four hours to the top of the eastern summit of Kaying Beli, 12,750 feet high. The climb was arduous and in many places difficult, but so magnificent was the panorama that gradually unfolded itself as we ascended that I at any rate was much too excited to notice the fact. Unfortunately the higher peaks, which on the way up had been clear, had already begun to veil themselves in cloud and to a certain extent also in dust haze by midday, when I was ready with my plane-table perched on the topmost pinnacle of rock. Nevertheless I obtained a panorama good enough for surveying purposes, together with a complete set of plane-table rays and clinometer readings, of a large number of peaks right round from north-west to due east, including the following : Sargalang ; the Chakragil massif ; Qungur I. ; Qungur II. and the Shiwakte group approximately (they were mostly under cloud) ; the whole array of peaks enclosing the Tigarman Su, Kaying and Qaratumush Jilghas, and on the opposite side of the main Qaratash valley the beautiful snows of the Ghijaq and Pitlik ranges. It must be understood of course

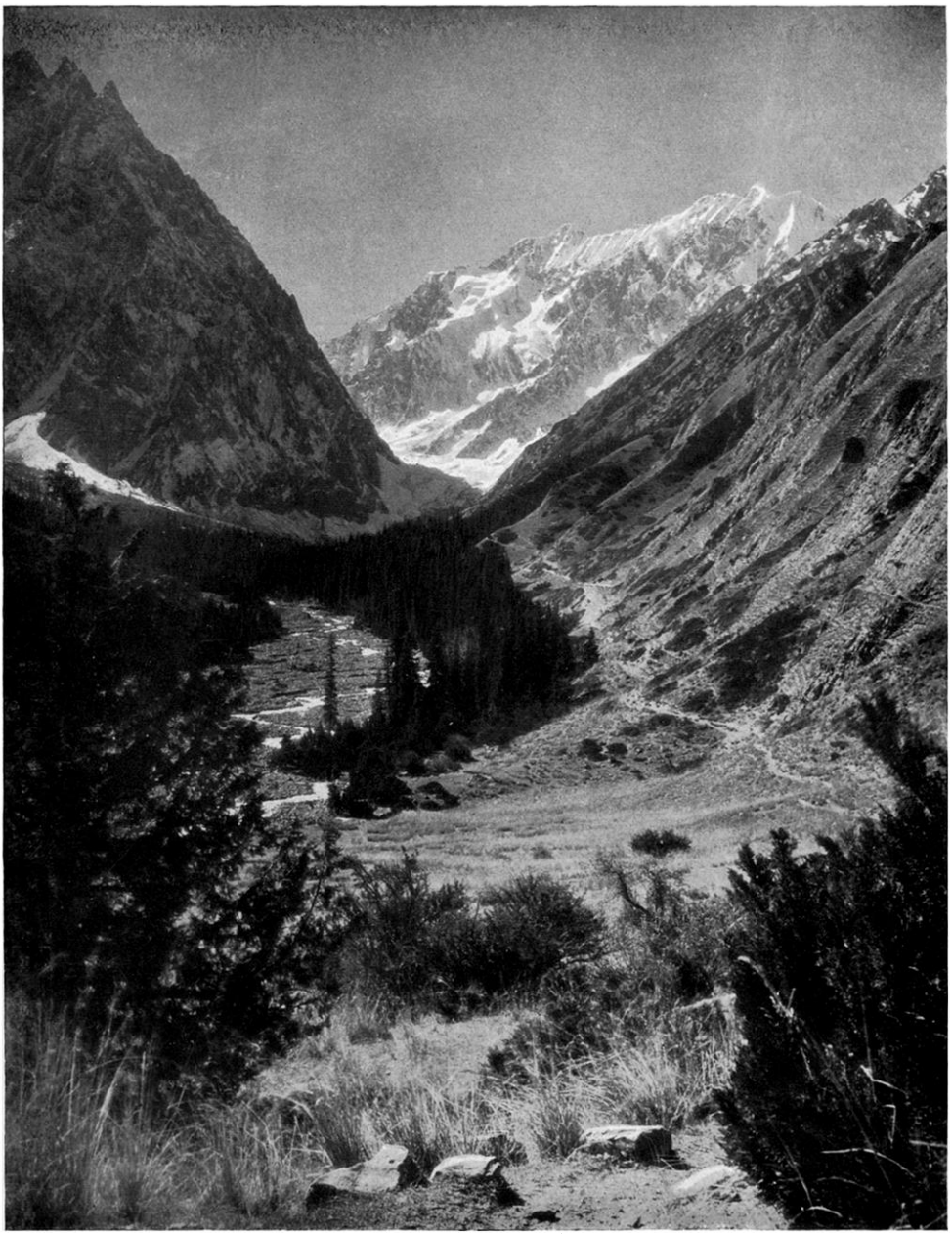


RAKAPOSHI FROM CHAPROT

CROSSING YAMBULAK DAVAN



UNMAPPED LAKE AT HEAD OF YAMBULAK JILGHA



KAYING JILGHA AND SHIWAKTE PEAK I.

QIRGHIZ OF QARATASH VALLEY

that I had very little idea of the identity of all these points on this, the first time I ever succeeded in reaching a coign of vantage among the forest of peaks in this area.

As often happens, the descent of Kaying Beli was much worse than the ascent, especially as the guide lost his way in attempting, against my wishes, to take us down by a short cut. Sunset found us on the edge of a 60-foot drop into the ravine we had ascended in the morning, faced with the alternatives of climbing about halfway up the mountain again or going over the side. The former was out of the question, as it would have meant being benighted in intense cold among the waterless crags of Kaying Beli. Before attempting the descent we traversed an exceedingly unpleasant grass slope pitched at an angle of 40° in the hope of finding an easier descent round the corner, but without success. Finally we took our courage in both hands and went over the side, and thanks chiefly to the admirable steadiness of Sangi Khan we reached the bottom of the cliff without mishap. Even then our troubles were by no means over, for there were several "dry waterfalls" to descend before we reached the bottom, and it was quite dark when we found ourselves with much relief in the valley-bottom of the Kaying Jilgha.

My wife and Nazaroff, who in their natural anxiety had come out with a search party and met me a mile from camp, greeted me with the interesting news that they had spent the day in a reconnaissance up the Kaying Jilgha; that the gorge was practicable for our convoy; and that two hours' march up it the jilgha widened into a broad valley encircled by magnificent peaks, in which they had found two or three Qirghiz families with their huts pitched in a sunny corner. The latter were ready and anxious to provide us with huts to sleep in if we came up. Needless to say we decided to take them at their word, and next day, leaving the tents at Bash Küprük in order to lighten the loads, we moved up the Kaying Jilgha and camped in the Qirghiz huts. On the way up I measured a base-line 1350 yards long in the only straight stretch I found in the gorge, and from it fixed with greater accuracy the relative positions of Stn. I., Stn. II. on Kaying Beli, the mouth of the jilgha and several other minor points in the neighbourhood; this was all I had afterwards on which to build my map of the Kaying Jilgha and its mountain system, and to connect it with Stein's route traverse of the Qaratash gorges. In all this region the great difficulty is that the chief summits are hardly ever visible from the valley bottoms.

Our new camp was at an elevation of 9200 feet, and the thermometer at night went down to 10° or lower; the felts of our huts were full of holes (for our kind hosts were very poor), so that we had the full benefit of the night winds and were inclined to congratulate ourselves on not having exposed ourselves to the still greater elevations of the Chimghan Jilgha, the very mouth of which is over 10,000 feet above the sea. But the dust-haze had gone, the brilliantly clear weather of late autumn

in Central Asia had set in, and when we saw what the upper Kaying Valley had in store for us we soon forgot any minor discomforts we might have suffered. For next morning we all three, escorted by the Qirghiz, rode up the valley towards the magnificent peak afterwards designated as Shiwakte I.; before we had gone a mile we found ourselves in a wood of big juniper trees, and, topping a rise, saw before us, nestling at the foot of black precipices 6000 feet high, a fine virgin forest of tall firs,* their deep shade contrasting perfectly with the brilliant snows of the Shiwakte behind. We were astonished and delighted, not only by the beauty of the scene but by the interest of our discovery, for it had not hitherto been known that fir forests of any size existed south of Bostan Arche, 50 miles away to the north-west under the snows of Ulugh Art, where Stein found conifers in 1915 at the end of his Third Expedition ('Memoir,' p. 40). The firs began to grow thickly, with individual trees 100 feet high or more, at an elevation of 10,000 feet and continued up to 12,000 feet. Yaks were waiting for us in a clearing of the forest, and mounted on these we reached by one o'clock a height of 13,100 feet on the lateral moraine of the Torbashi glacier, a tributary of the main Kaying glacier. Here we were surrounded by an array of precipitous snow-peaks from 17,000 to 19,000 feet high, their faces clothed with hanging glaciers; far below us we could see the forest and the milk-white glacier-stream curving away behind tremendous black pinnacles towards the main gorge.

Next day, the last we could spare in the valley (for we were due on October 26 in far Yarkand and were already likely to be late), I climbed with Sangi Khan and two Qirghiz carrying my plane-table and cameras to a height of 13,430 feet on a splintered rock-ridge called Nichke Qir, immediately under the high chisel-shaped peak of Kök Döng, that same offshoot of the Shiwakte, 16,800 feet high, which we had seen from Saman. The climb, though exceedingly steep, was not so difficult as that of Kaying Beli, and the air was this time perfectly clear; I was thus able to spend three hours at this station (No. III.) and take a panorama of, as well as rays to, most of the same peaks I had photographed from Stn. II. Qungur II. (which I then mistook for Stein's Qungur I.) was just visible over the top of the Kök Döng ridge, and with one of the very few slow plates I had with me I obtained an excellent telephotograph, the first ever taken of the east face of Qungur.

I was greatly helped in the identification of the peaks I had seen from Stn. II. by having with me the negatives of the panorama I had taken at the latter station, and had, as usual, developed in camp as soon as possible. In a region where you seldom see the higher mountains between stations, the great difficulty is identifying peaks seen from different points; Stein had warned me of this, and it was for this reason

* Similar in appearance to, and probably identical with, *Picea Schrenkiana* of the Tien Shan.

that I always carried a developing outfit with me in camp. I could thus compare the view I was looking at with the negatives of photographs I had taken of the same mountains from other stations, and identification of salient points was comparatively easy.

I was thus able to plot in many of the peaks and glaciers I had seen from Kaying Beli. But I still could not see more than a small fraction of the east face of Qungur, and the configuration of the Shiwakte range was not at all clear to me, owing to the great ridge of Kök Döng and Sarigh Yon which partially concealed the view to the west and south-west. I saw that I must somehow or other, during my next visit, conquer the knife-edge ridges which completely enclose the upper part of the Kaying Jilgha.

On our return journey down the Qaratash we reached Qurghan by a short cut from the upper Kaying valley by crossing on yaks the steep but easy Chopqana pass (11,500 feet) immediately above our camp and descending the jilgha of the same name. This valley is about 8 miles long, and its stream, not being fed by any glacier, is small, but it boasts several patches of fir forest clinging to the north face of the Kaying Beli ridge, and, the grazing being good, several families of Kirghiz inhabit it. The stream joins the Qaratash a mile above Qurghan. There was quite a muster of Qirghiz at the latter place, and next morning when we struck camp they seemed genuinely sorry to bid us adieu and begged us warmly to come again next year.

Leaving Qurghan we sent the caravan to Saman only, as we intended to reconnoitre the Achiq Jilgha, at the top of which I had heard there was a pass leading over to the Gez River. The map shows the Achiq Jilgha as trending from west-south-west to east-north-east, and the watershed as being 6 miles west of the Qaratash valley; we found, however, that the glen was a short one, only about 3 miles long, and that its general trend was east to west. The watershed here is only $2\frac{1}{2}$ miles back, though farther down it is much more: the system of foothills in all this region is very complicated, consisting of a perfect labyrinth of defiles and rocky ridges. The track over the Achiq Pass to Kauruk Qaraul on the Gez was not difficult, I learnt, and was often used by our own Consular couriers when the Gez was in flood; one more pass after the Achiq Davan, the Kauruk Bel, has to be crossed. The former pass (9,800 feet) is steep for the last 1000 feet, but not difficult for loaded animals. I made a note of it as a possible alternative to the long and arduous "Nine Passes" route.

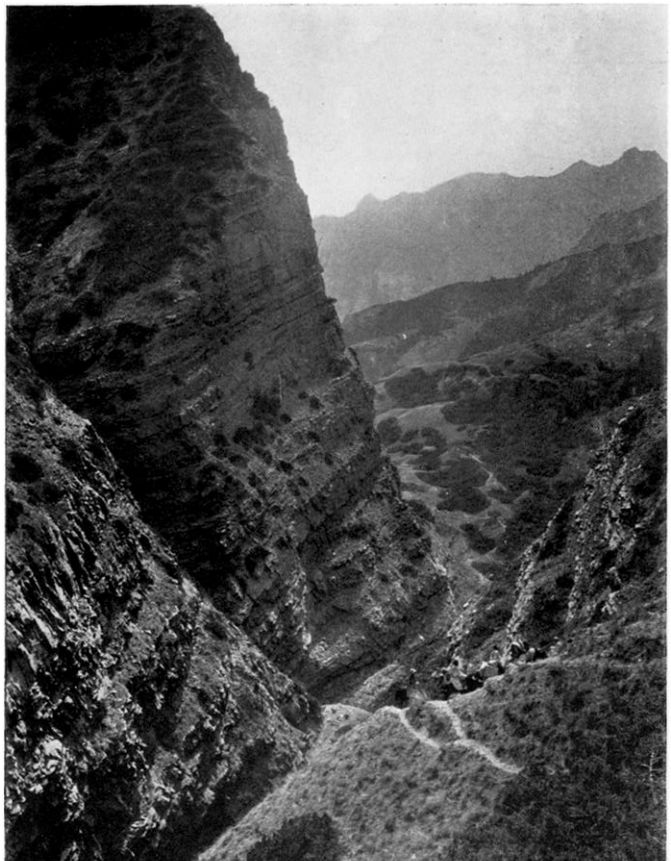
At the fords above and below the "Narrows" near Saman we found that the water had fallen very considerably during the ten days which had elapsed since we had passed this point on our journey up. The change from summer to winter level in these rivers is often surprisingly rapid, and seldom takes more than ten or fifteen days. Observation is complicated by the diurnal changes of level, which differ for different

streams and at different points on the same stream. At Kaying Bashi (10,400 feet) the rise in the river caused by the action of the morning sun on the glaciers took place between 4 and 5 p.m. in the summer months; at Altunluk the daily flood-water came down in the small hours and had subsided as a rule by 11 a.m.

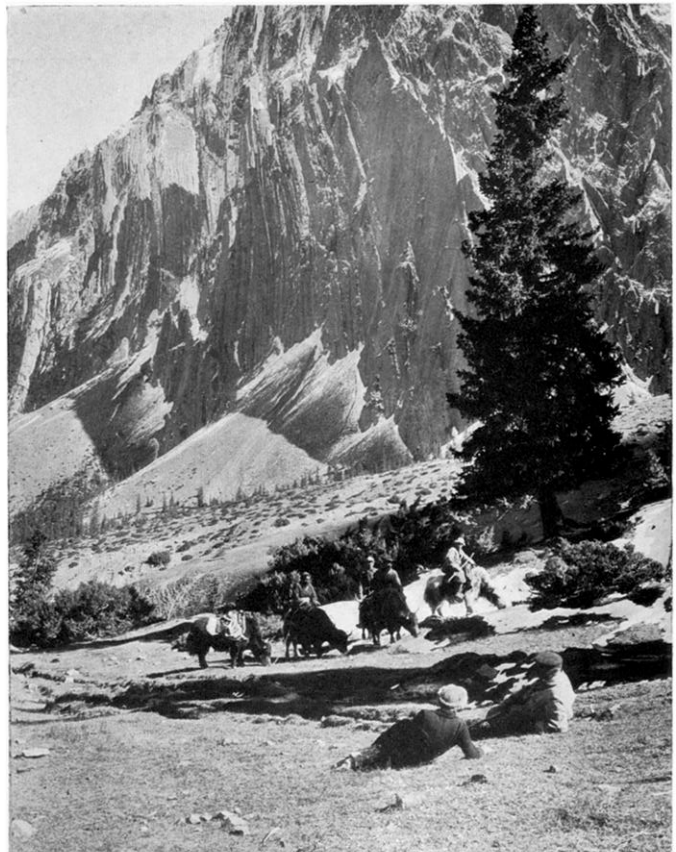
The next occasion on which we visited this region, though only hurriedly, was in the following April (1923), when we found ourselves at Yarkand in the course of a short spring tour with a fortnight to spare for the return journey to Kashgar. Leaving Yarkand on April 2 we marched up into and across the interesting Qizil Tagh (Red Mountain) region by tracks hitherto unused by European travellers. The peaks of the Qizil Tagh attain 16,000 feet and more, and there are small patches of fir forest at two or three points high up on their north faces. Even this, however, is not quite the extreme limit of conifers in this direction; I was told by Dr. Nyström, the head of the Swedish Mission at Yarkand, that in his search for a summer camp in 1922 he had found small fir woods at a place called Ai Bulung above Koserab on the west bank of the Yarkand River. It would be interesting to know whether any other traveller has found conifers in the Yarkand River valley; none are mentioned, so far as I remember, in any of the books I have read.

Crossing three passes of 10,000 feet or more in one day we descended into the Qinqol valley, which we crossed and camped a mile or two up the hitherto unexplored Chumbuz Jilgha. My object was to find out if there was any practicable pass, other than the Ghijaq, affording access to the Upper Qaratash valley from this side. For safety's sake we sent our caravan round by the Ghijaq Pass to wait for us at Chat, and ourselves pushed up the Chumbuz Jilgha with yaks and a minimum of baggage to a summer pasturage called Kizmak (12,500 feet). We slept the night in the hospitable huts of the local Qirghiz Beg (in this case a lady), and crossed the Kizmak pass (14,000 feet) next morning. We were surprised (and no doubt very lucky) to find no snow on the top, but the descent on the west side into the Qaratash valley was excessively steep and showed signs of earlier avalanches.

That night we camped at the small Qirghiz settlement of Chat (11,000 feet), just above the junction of the Ghijaq and Qaratash streams, where we found our caravan waiting for us and our tents pitched. Six inches of snow fell that night, but next day was glorious, and I was lucky to secure, from a point 1500 feet up the hillside to the east of Chat, a fine panorama not only of the whole Upper Qaratash valley basin, but of the huge ice-clad dome of Qungur II. and several of the Shiwakte peaks, to say nothing of the Chimghan range and the upper mouth of the main Qaratash gorges. My delight at securing a photograph and a set of rays of Qungur and the Shiwakte at *right angles* to those I had already got can be imagined; they have enabled Major Mason of the Survey of India, in his map based on my materials, to plot in a large part



BOZARGA GLEN, YAPCHAN JILGHA, ON ROUTE TO TIGARMAN SU JILGHA



FOLDED LIMESTONE IN UPPER KAYING JILGHA

TIGARMAN SU JILGHA AND KÖK DÖNG

of the unexplored Upper Chimghan Jilgha and the tremendous peaks which enclose it.

Next day we dived into the great gorge. We would very much have liked to spend two or three days exploring the Upper Chimghan Jilgha, a fine wide valley with grand snowy ranges (the Tersöze to the south and the Chimghan to the north) rising 8000–10,000 feet on either side; but in mid-April the summer floods may come down any day, and it was inadvisable to run the risk of being caught in the middle of the gorges.

As it was, the water in the river, which we had to cross twenty-eight times between Chat and Qurghan, was only just low enough at most of the fords for horses to cross with safety. The journey down through the gorges to the mouth of the Kaying Jilgha was a strange experience. The mountain sides towered up 10,000 feet on either side, with occasional hanging glaciers visible far above; the river dashed backwards and forwards between its rocky walls, high up the face of which one could here and there make out the track, a few inches wide and carried from ledge to ledge on the trunks of young fir trees, which in summer forms the only communication between the inhabitants of some of the glens and the outer world. We had hoped to reach Bash Küprük, our old camping-place, by nightfall, but failed to do so owing to the frequency with which we had to unload and reload our ponies among the boulders of the Arasunde gorge; we camped instead a mile below the outlet of the Qaratumush stream, in the dark, on a narrow spit of land boasting a few bushes and small trees but hardly any grazing for the animals. There was light enough as we passed the mouth of the steeply pitched Qaratumush Jilgha to see patches of fir forest away up under the glaciers. Three families of Qirghiz inhabit this wild glen, the only entrance to which, apart from the main gorge, is a razor-edge "pass" 15,000 feet high leading over from the Ghorumde side-glacier of the Kaying Jilgha. This "pass" is seldom open before August.

After that day's march the Tügene-tar gorge below Bash Küprük and the remainder of the Qaratash valley was plain sailing, and we marched the 48 miles to Akhtur Bazar in two days.

Two months later, towards the end of June, we left Kashgar for our long-anticipated summer holiday in the Kaying valley. We knew that the water in the Qaratash would be too high to permit of our following our former track all the way, but we were determined to get there somehow, even if it entailed following the toilsome "Nine Passes" trail up the Gez valley and then crossing into the Qaratash valley by the Achiq Pass. As it turned out, we managed to cross the river at its widest and shallowest point in the reach above Altunluk with the help of a dozen sturdy villagers. Thence we kept up the same side of the river all the way to the mouth of the Chopqana Jilgha; the only place where the main river valley had to be left was at the narrows below Saman, which we successfully "turned" under the guidance of a delightful old Qirghiz

aristocrat called Samsaq Bai, whom we luckily met at this point. Samsaq took us 6 weary miles up dry and absolutely barren defiles to the west and across a short but terribly steep "pass" called the Aqsi Davan, over a lofty outcrop of red sandstone 9600 feet high. The last 200 feet of the "pass" consisted merely of a narrow passage pitched at an angle of 30° between perpendicular walls, leading up to a cleft in the rocky backbone. It took two hours to push and haul our animals, including my wife's unfortunate riding-camel Sulaiman, up this passage and to man-handle most of the loads over. On the further side dry nullahs similar to those we had ascended led down to the Qaratash valley, which was joined just below Saman. The whole *détour* occupied seven hours. After this the Chopqana Pass, which we crossed next day (thus avoiding the now impassable Tügene Tar), presented no difficulties.

Arrived at Kaying Bashi, we camped for three weeks on a sheltered Alpine meadow commanding magnificent views of forest and river, towering crag and pale green hanging glacier, wide flower-spangled pastures and thickets of juniper and barberry. The profusion of Alpine flowers was wonderful, and we did as much amateur botanizing as our total ignorance of botany permitted; in the course of our visits this and the following year, we pressed some thirty-seven varieties and obtained the seeds of seven or eight; my wife also painted most of the more striking kinds. This small collection has been examined by Mr. W. B. Turrill, of the Kew Herbarium; his comments will be found at the end of this paper (Note II.). To a layman, the striking thing about the flora of the Kaying and neighbouring valleys is that it is of a distinctly Central Asian rather than of a Himalayan type, although the valleys in question are only about 180 miles as the crow flies from similar regions of Northern Kashmir, the flora of which is, I believe, Himalayan. Of the thirty-seven varieties brought home by us, seventeen are confined to Central Asia, thirteen are found in the northern temperate regions of Europe and Asia, but not in the Himalayas, and only seven are common to the "Alps of Qungur" and the Himalayas. The flower that interested us most of those we found was a sweet-smelling kind of stock which only grew in small isolated patches among the loose stones of glacier moraines between 13,000 and 14,000 feet in elevation, near the highest limit of vegetation; this has been identified as *Parrya flabellata Regel*, previously found only in the Tien Shan. One of the specimens of *Astragalus* we found has proved to be a new species, allied to *A. Alpinus*, but with calyces longer. The conifers of the region are also those of the Tien Shan and not of the Himalayas; with the exception of the small patches of fir forest mentioned above as existing in the Qizil Tagh and at one or two places in the Yarkand River valley, they mark the extreme south-eastern limit of the Tien Shan firs. So far as I know, no fir forests exist in the whole of the Kunlun system.

We saw a great deal of our Qirghiz friends, not only the seven families

who lived in the Kaying Jilgha, encamped for the summer on another meadow about 1000 feet above ours, but those of neighbouring glens who came flocking to see us. My wife gave a tea-party for the ladies, to which women carrying babies came over dizzy passes and through roaring torrents; but they swarmed round her even more eagerly for medicine, the appetite of the Qirghiz for which is insatiable. We also fed the men heavily on boiled sheep and their own indigestible barley bread and sour cream, and spent hours talking to them in their huts. I was thus able to note down a certain amount of information regarding their manners and customs, folklore, mode of life, and social organization. But my chief concern was always to find a way out of the valley to the east or south, which would enable me to map and photograph the eastern face of Qungur and the Shiwakte. The only pass of any kind that existed, I found, was one called the Kepek at the very head of the Kaying glacier to the south-east of Shiwakte I., leading over to a side valley of the Chimghan Jilgha called Aghalistan. The idea of getting by this route into the Chimghan Jilgha at last made me very anxious to cross the Aghilistan pass, but from personal reconnaissance and inquiries from the Qirghiz I found that it could not be crossed even by unencumbered climbers until August, when the worst of the ice and snow had melted off it. As our visit could not be prolonged after July 15, I was obliged to postpone any attempt to cross until the following summer. The daily clouding over of the sky in the afternoons and the frequency of rainstorms rendered regular survey operations at high altitudes almost impossible; but I managed to climb to the top of the knife-edged ridges which enclose the valley at two points, each time after one or more preliminary failures. The first occasion on which I was successful was when, starting at 4 a.m. with Sangi Khan and two Qirghiz, I reached at noon Stn. IV. on the Sarigh Yon ridge 5200 feet immediately above our summer camp. From this point, where the thick snow cornice literally overhung the Tigarman Su valley on the further side, I obtained a magnificent view, which I photographed right round from north-east to north-west, only the northern quadrant of the horizon being hidden by the mass of Kök Döng above me. I also took a very useful set of rays to large numbers of peaks with which, thanks to the panoramas I had taken from Kaying Beli, Nichke Qir, and Chat, I was becoming familiar. I was greatly disappointed to find that the clear view of the whole eastern face of Qungur which I had confidently expected was still denied me; all except the top of the long massif was hidden by the 17,000-feet ridge right opposite me on the west side of the Tigarman Su Jilgha. Part of the Shiwakte range, again, was hidden by the Sarigh Yon peak * quite close to me on the south and some 700 feet higher, but I got a most

* I would very much have liked to climb this, and would have got a far better view of Qungur and the Shiwakte from it, but the snow on the topmost arrête was by midday dangerous.

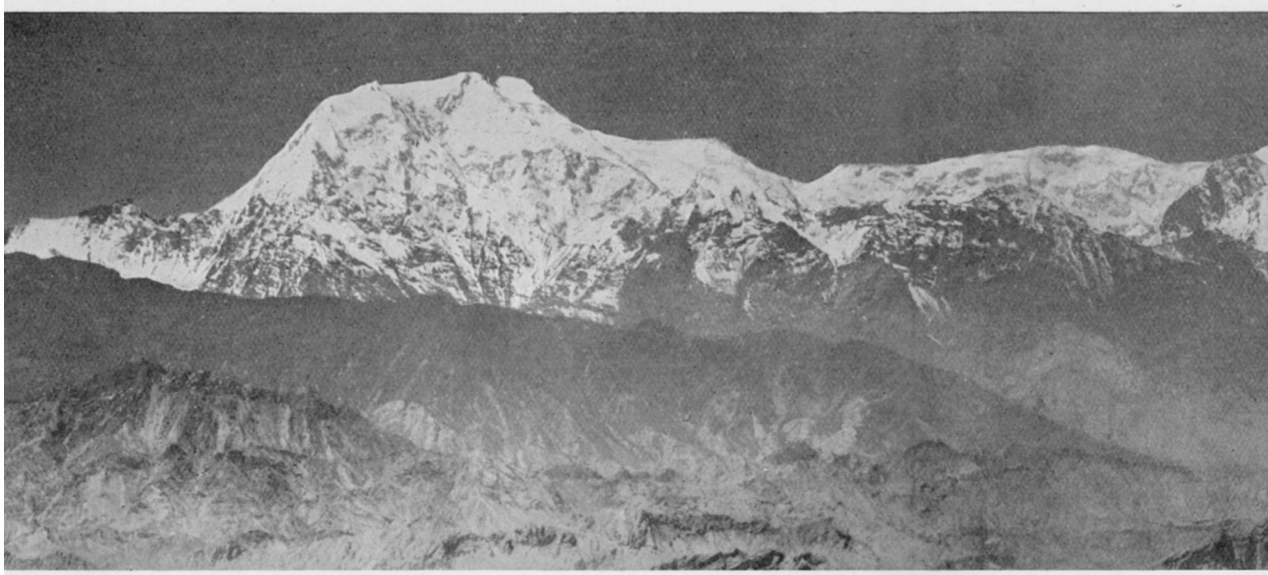
striking view, which I telephotographed, of three of the peaks afterwards identified as Shiwakte I. (19,400 feet), IIIa. and III. (20,400 feet) respectively. I was also interested to see, far below me in the depths of the trough-like Tigarman Su Jilgha, part of a considerable patch of fir forest.

The second occasion on which I attained a commanding position was after a 6000-feet climb (the first half of it with the help of yaks) to the top of the razor-like Zumurrat ridge. I first tried this climb from the west, *i.e.* from the main Kaying glacier, but was brought to a standstill by unscalable crags at 14,500 feet. I next ascended with yaks the very steep and trying icefall of the Zumurrat glacier, and then on foot struck up a 2000-foot couloir on the east side of the ridge; this time Sangi Khan and I (not the Qirghiz guides, who collapsed) climbed within 500 feet of the top, but were held up by dangerous snow in the couloir. A week later, the melting of the snow having progressed rapidly, we tried again with a couple of tougher Qirghiz. This time we reached the col, which carried a tremendous cornice of snow, at 1 p.m., and were rewarded by the finest mountain view I have ever seen. The whole of the Shiwakte group, glittering like colossal icebergs clothed with hanging glaciers thousands of feet high, stood right opposite me to the west from 4 to 6 miles away. Again Qungur was almost entirely hidden, this time by the Shiwakte, but enough of the top of Qungur II. was visible for me to get a most useful ray on to it. Far away to the south-west I saw a high snowy ridge which I afterwards found to be part of a range 22,000 feet high on the south side of the upper Chimghan Jilgha, opposite Qungur II. Between me and the Shiwakte group was the row of jagged ice-clad peaks at the head of the Kaying Glacier, which I named the Aghalistan Mountains from the name of the valley on the other side of them; of the two well-marked cols between the chief massifs only the right-hand one, the Kepek Pass, is possible.

Coming down I had a somewhat alarming experience: crossing a small branch of the main couloir filled with ice, my foothold gave way and I shot down like an arrow from a bow for about 40 feet, landing quite comfortably in the middle of the deep snow of the main couloir, but receiving some slight bruises on the way. I might, of course, have started an avalanche; this would have been serious the week before, but now there was not enough snow to make a dangerous avalanche; two came down the couloir later in the afternoon, but they were not very alarming affairs.

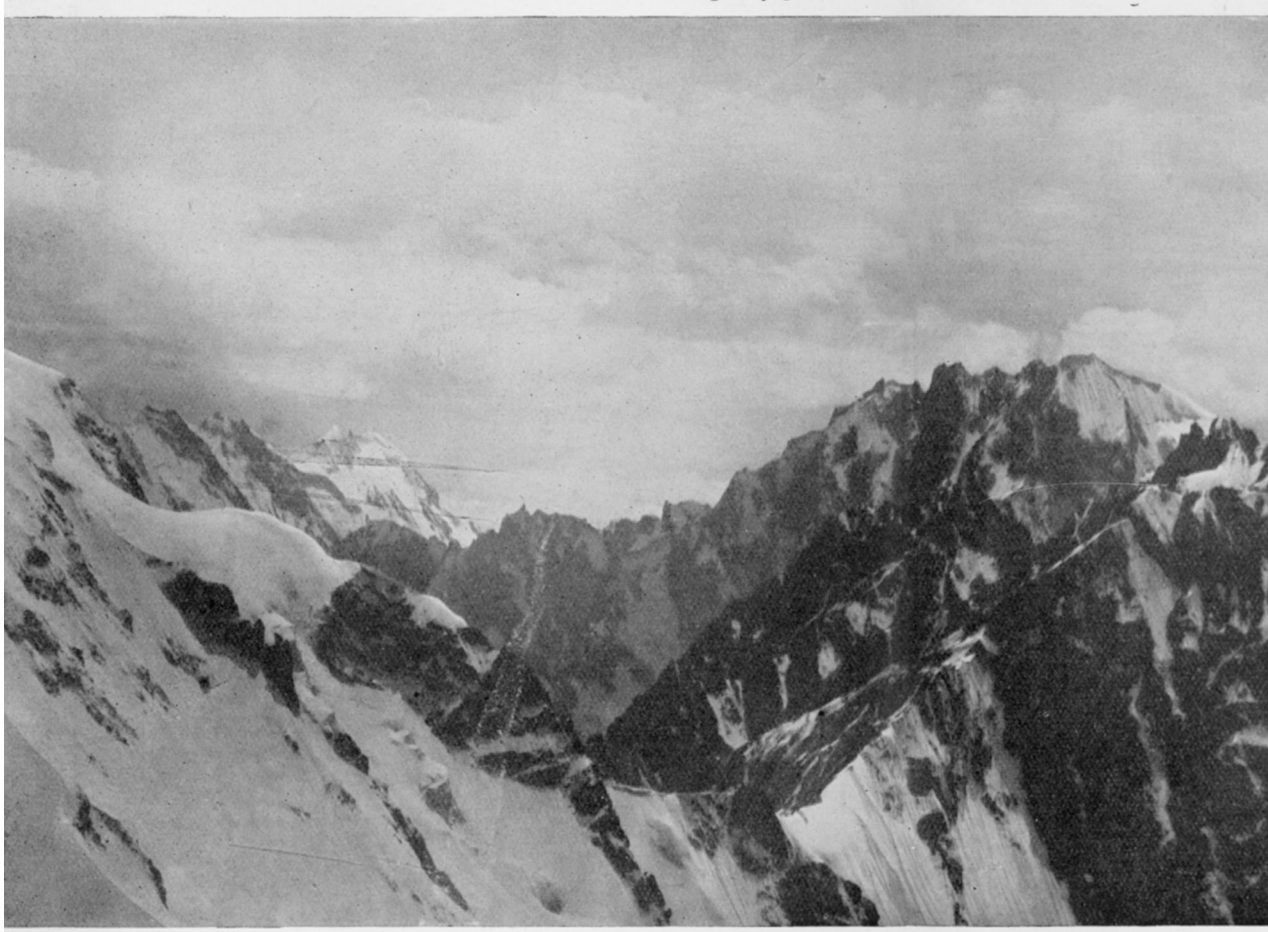
Besides these major climbs, my wife and I reconnoitred on yaks the Torbashi, Ghorumde, and main Kaying glaciers, mostly up the lateral moraines, the going on which was sometimes very bad. The Ghorumde glacier valley is typical of the region; you follow the stream up among scattered clumps of fir and find unexpectedly that more than half of it comes out of the ground from the midst of a fir coppice at the foot of

Qungur II.

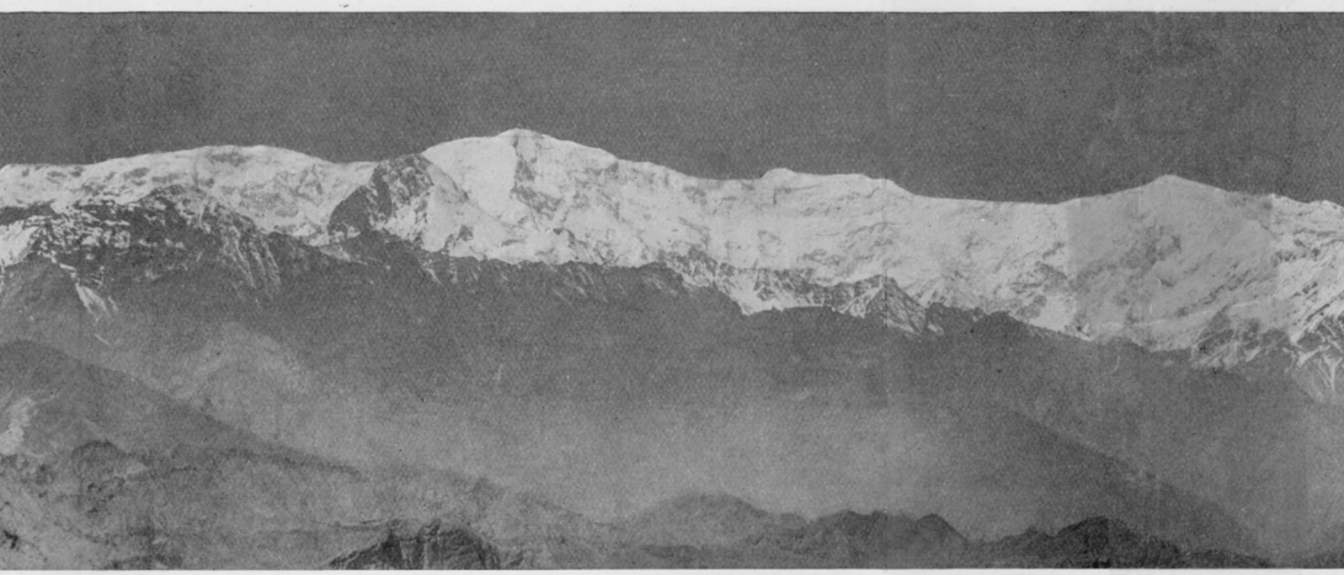


QUNGUR RANGE, LOOKING

Chimghan Jilgha.



SHIWAKTE GROUP, LOOKING SOUTH-WE

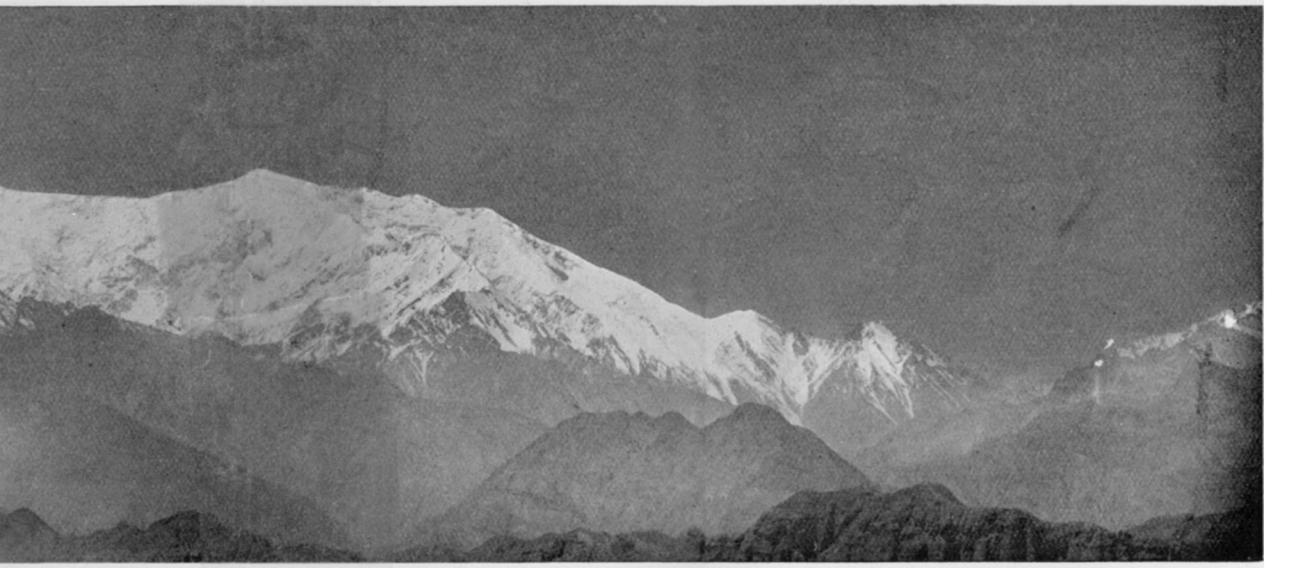


QUNGUR RANGE, LOOKING SOUTH-WEST FROM AQSAI DAVAN, 9400 FEET. 75° 40′ E., 35° 53′ N.

Peak IIa.

HIWAKTE GROUP, LOOKING SOUTH-WEST FROM STATION V, 16,200 FEET, ON ZUMURRAT RIDGE. 75° 31′ E., 38° 36′ N.

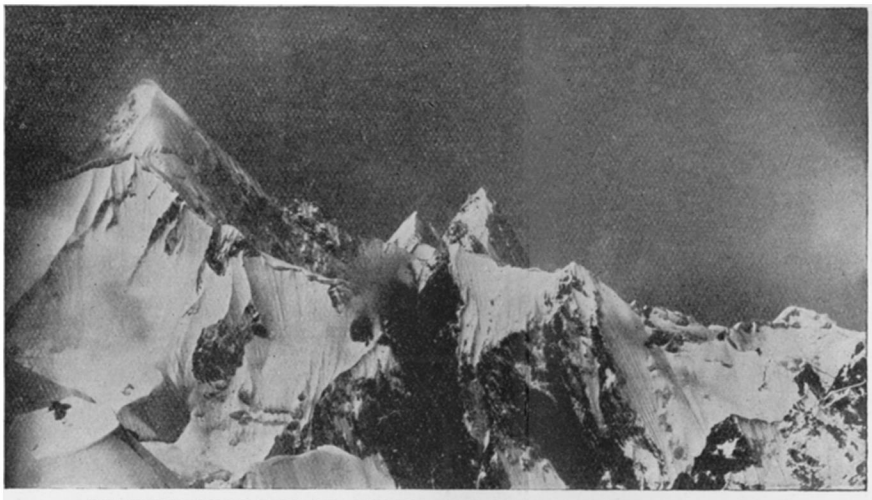
Gez Dara.



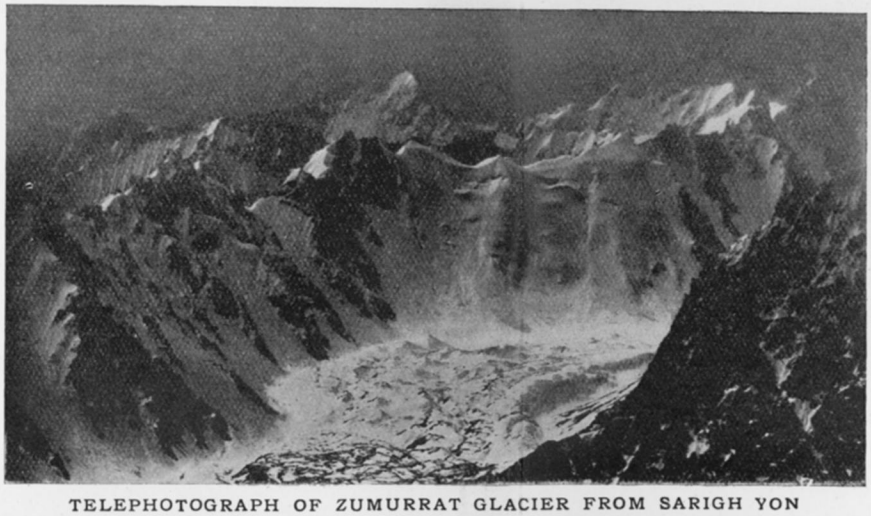
EET. 75° 40′ E., 35° 53′ N.

Peak IIa. Peak II. Peak III.

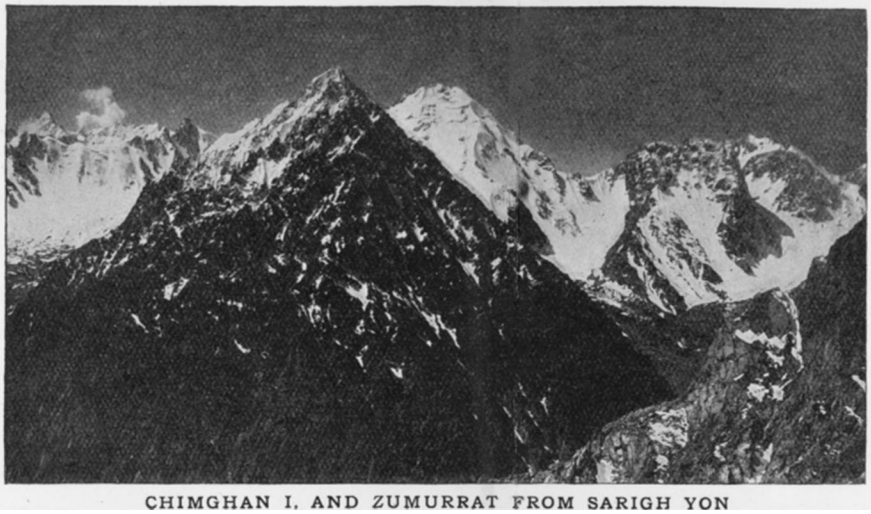
MURRAT RIDGE. 75° 31′ E., 38° 36′ N. Kepek Pass.



TELEPHOTOGRAPH OF SHIWAKTE GROUP FROM SARIGH YON



TELEPHOTOGRAPH OF ZUMURRAT GLACIER FROM SARIGH YON



CHIMGHAN I. AND ZUMURRAT FROM SARIGH YON

RIGH YON

ARIGH YON

YON

KAYING GLACIER FROM TOP OF KEPEK PASS

HEAD OF KAYING GLACIER AND KEPEK PASS

CROSSING KEPEK PASS

the ancient terminal moraine, which rises steeply above for 1000 feet or more covered with Alpine flowers and juniper scrub. At the top of the rise are pastures with two or three Qirghiz huts, and away behind for miles stretches the glacier-filled valley up to the almost perpendicular ice-clad backbone of the Chimghan range.

A word here on the glaciology of the region. My researches on this subject are confined to a perusal of the appropriate section in that immortal work 'Hints to Travellers,' but the veriest beginner could say with some confidence that all the main glaciers I examined under the eastern flanks of Qungur and Chakragil are in full retreat. In most cases ancient terminal moraines could be clearly traced far below the present glacier-foot, and the "toes" of the glaciers themselves were generally shrunk to a remarkable extent. The most striking instance of this was in the case of the great Oi Tagh glacier among the Alps of Chakragil.

When we left Kaying Bashi this time we sent the caravan with our riding-horses straight to Saman, borrowed some yaks, and spent two nights as the guests of our friend Samsaq Bai, at his *aq-ois* pitched 12,000 feet up at Bozarga, on the southern slope of the Zor Qir ridge. The march to this place was an arduous but extremely interesting one. After crossing the Chopqana pass, instead of descending the glen of that name we kept round to the left and traversed for several miles the steep pine-clad northern face of Yelpakhtash, the three great crags of which, 13,000–14,000 feet high, towered above us on the left. In some places the trail crossed unpleasant rocky outcrops, in others the muddy tracks of recent landslides, where the whole mountain face, forests and all, seemed in a state of unstable equilibrium; elsewhere again the path, level and quite well engineered, led through pleasant forest glades for all the world as if we were among the Simla Hills. At the beautiful alp of Yapchan, of which we made a careful note for future camps, the path suddenly dived into the depths of a gorge and then crawled up an apparently impossible cleft in the great pine-crowned red sandstone cliffs of Bele Tök, 1500 feet high and very nearly perpendicular. We seemed at one point to be in a perfect *cul-de-sac* with cliffs literally overhanging us on three sides; but Samsaq led us up to a ledge, invisible from below, along which we traversed the cliffs to the left and found ourselves in a steep and narrow but comparatively straightforward gully. Further up we came to masses of wild rose and clematis with clumps of fir and a spring of clear water, until at last, 2000 feet above the bottom of the Yapchan gorge, we saw the huts of our old guide and his large family in front of us on a grassy knoll.

Hearing that there was an easy pass, the At Bel, quite close to us leading over Zor Qir into the Tigarman Su Jilgha, I resolved to reconnoitre it; but that night a wild storm of sleet and rain came on which continued for twenty-four hours and kept us close prisoners in our

hut the whole of the next day. The following morning, however, it was brilliantly fine, so before leaving for Saman we climbed to one of the summits of the Zor Qir ridge. From this point, 13,000 feet high, I obtained useful rays to the magnificent Chakragil massif, to Qungur II., and, no less important, straight down the lower reaches of the Qaratash to the Akhtur oasis; but I was disappointed once more in my expectations of a view of the eastern face of Qungur, for the snowy ridge dividing the Tigarman Su from the Qurghan Köl Jilgha hid all but the very top of Qungur II., while the vast mass of Kök Döng shut out the whole view from south-west to south-east.

Next day when we crossed the Aqsai Pass from Saman with our caravan (a much easier task from the south side than from the north) it was again brilliantly clear, and I obtained from the top of the ridge a very good telepanorama of the whole Qungur massif. The picture ought to include the Shiwakte group, which looked most impressive with its sheaf of needle peaks; but here the evil genius of the photographer stepped in, and I fogged the fourth and last plate of the telepanorama by failing to replace the dark slide of the plate-carrier firmly before removing the plate from the camera. This view of the Shiwakte would have been invaluable for survey purposes, and I regretted its loss more bitterly than that of any of the numerous pictures I lost through carelessness or ill luck.

The following summer (1924), though we expected to be leaving Kashgar for good early in September, we managed to work in a last fortnight among our beloved "Alps of Qungur" in July-August. This time we decided to make first for the Yapchan Jilgha before going to Kaying, as I was anxious to reconnoitre from it the Tigarman Su Jilgha and possibly beyond. Two days were delightfully spent among the pines and amazing riot of flowers of the beautiful Yapchan alp, opposite the magnificent red cliffs of Bozarga and Bele Tök.

Then with an irreducible minimum of retinue and baggage carried on yaks we climbed once more the secret track to Bozarga and crossed the At Bel pass (12,000 feet) behind it. Descending grassy slopes for 2000 feet we found ourselves at the prosperous-looking encampment of Oi, the summer headquarters of the "Nasir Beg," * of the Tigarman Su Jilgha. Here, to our surprise, we were told that we were no longer in the Yangi Hissar district but under the jurisdiction of the magistrate of the Chinese Pamirs at Tashqurghan, eight marches away. The Beg did his best to make us stay the night with him and go back next day without venturing down into the wild Tigarman Su Jilgha, the path to which he described as very difficult; but finding that we were determined, he did his best for us and lent us six fresh yaks for the onward journey in place of our tired ones. The track proved narrow and up-and-down but not dangerous, and two hours later we topped the last

* A kind of minor headman subordinate to the Beg of the region and responsible to him for the revenue of one *jilgha* (valley).

col and looked right up the deep trough-like valley of the Tigarman Su Jilgha (so called from an old mill (*tigarman*), near which is a shrine). A mile further we came to fields of meadowsweet and the first tall firs, and were met by the old headman of the tiny Kirghiz community (three families) whose tents were pitched in a clearing in the thick forest beyond.

We stayed here three nights, but were unable to do much as it rained nearly the whole time. One of my objects had been to climb the Dilbagh "pass," a 13,000-feet col leading over to the Qurghan Köl Jilgha, another large unexplored glacier valley of Qungur; from this col I hoped at last to see the inner arcana of the great range. But when we tried it the first morning, down came the clouds and we had to turn back half-way. As for the peaks at the head of the Tigarman Su Jilgha, of which I had hoped to obtain a close view, they never cleared of cloud at all. However, the valley bottom and glacier foot which we explored were well worth close examination, and the Qirghiz were an exceptionally friendly and interesting community. A striking feature of the valley was a flood of shell-pink water which gushed out of "caverns measureless to man" at the foot of the forest-clad terminal moraine of what must have been a vast glacier filling the Tigarman Su valley in ancient times. We found the source of the pink colour 2 miles higher up, where at the foot of the existing glacier we discovered beds of red clay over which a strong stream flowed from the glacier for 100 yards before disappearing into the earth.

Another feature of the jilgha is the abundant evidence of the presence of copper. I was told, indeed, that a rich vein of copper ore used once to be worked in a terrifying and barely accessible cleft high up on the north-west face of Kök Döng, but that the working had been discontinued twenty years ago for fear of the military authorities hearing of it; this would have meant the mine being taken over and the Qirghiz forced to work in it for the benefit of the military authorities, who in Kashgaria regard all mineral rights as their monopoly.

There is absolutely no exit from the upper part of the Tigarman Su Jilgha, nor can it be reached in summer from the Gez defile, as the lower course of the stream lies through a deep and narrow gorge impassable in the high-water season. The only access to the valley is by the way we came, that is to say, up the Chopqana Jilgha, across the upper Yapchan J. (the lower gorge of which is also impassable) and over the At Bel Pass; and that is not possible for loaded ponies, only for yaks. Nor would it be possible for a stranger to find the way up to the At Bel without the guidance of the Qirghiz.

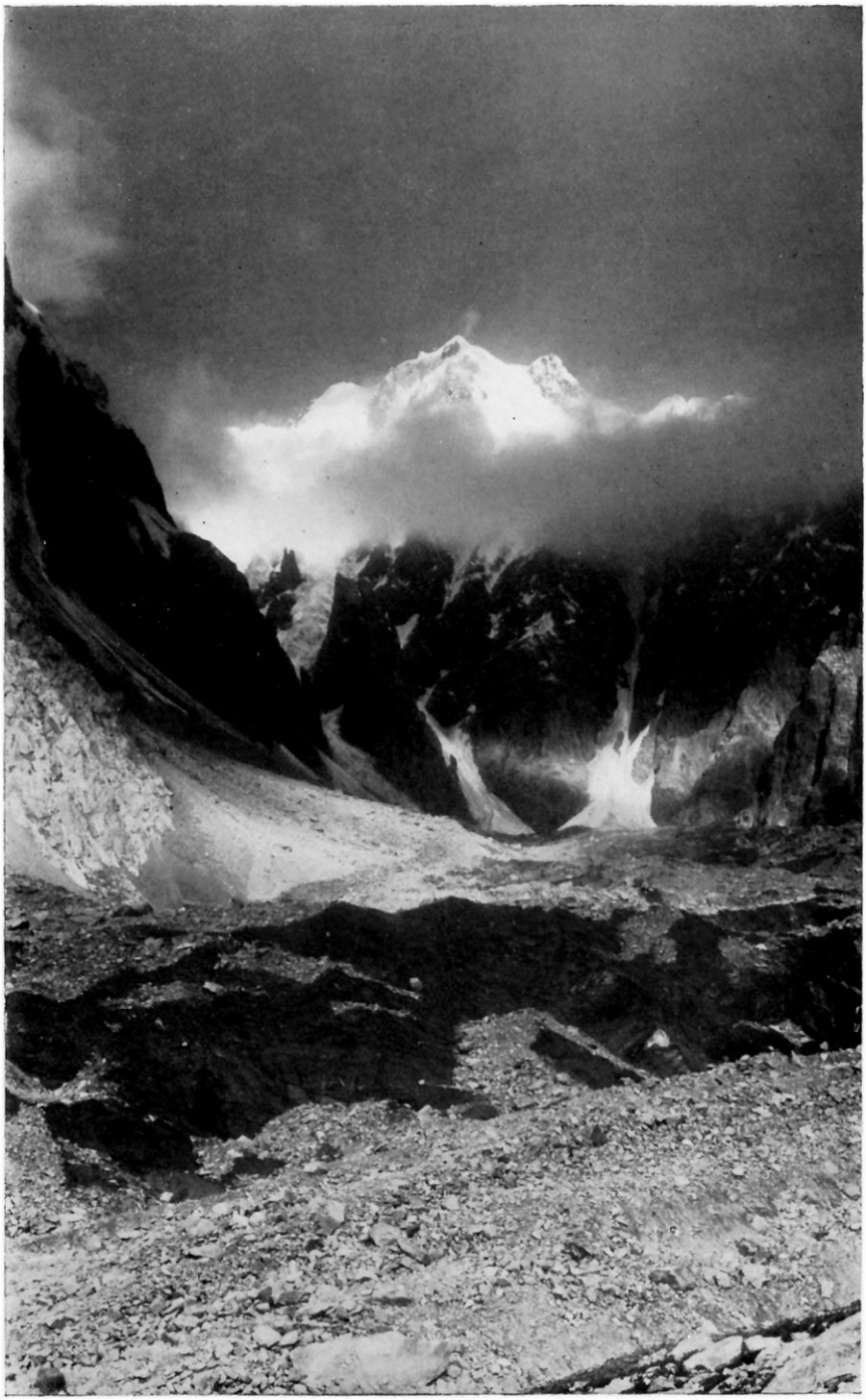
On our return to the Yapchan alp, where we had left our tents, we went out of our way to visit Samsaq Bai and his clan, who were encamped this year just behind the fir-clad crest of one of the great red precipices of Zor Qir. A grassy ridge dotted with neat clumps of fir and juniper, very much like a well-laid-out park, jutted out over the Yapchan valley,

and on this the huts were pitched; the grazing all round was excellent, but the place had one drawback in that the unfortunate ladies (who do all the hard work in a Qirghiz camp) had to descend 600 feet to the spring in the Bozarga glen for their water.

After this trip we had only eight days to spare for Kaying Bashi, where we camped once more at the lovely alp below the forest. Only four of our eight days were fine. On one of these I climbed *viâ* the Tor Bashi glacier to the top of the knife-edge ridge at the head of the Tigarman Su glacier. Here, at 16,100 feet on a south face, there was still a great deal of soft snow, and with only a Qirghiz boy to help me I had great difficulty in reaching the top of the cornice. I was armed only with a prismatic compass and my film camera on this occasion. With the compass I obtained some very useful angles on to some of the mountains on the other side of the Chimghan Jilgha, which appeared above the peaks of the Aghalistan range, also down the Tigarman Su Jilgha. The latter enabled me to fit my plane-table sketch of Tigarman Su on to the rest of my map. With the camera I secured a fine picture of the ice-clad peak of Shiwakte I. (19,400 feet) piercing the clouds right opposite me.

The only important piece of work I managed to do during this all-too-short visit was the crossing of the Kepek Pass into the basin of the Chimghan Jilgha. Only now, in the first week of August, did the Qirghiz pronounce the pass to be sufficiently clear of snow for a crossing to be attempted. Even so, the col was so steep for the last 1000 feet and so filled with glacier ice that there was no question of yaks going up it. Accompanied only by Sangi Khan and three Qirghiz hunters, I left my wife in camp for a night by herself and started at 5 a.m. with a supply of cold food and Bovril, my two cameras, a sleeping-bag with a blanket, pillow, etc., in it and my plane-table and instruments (including clinometer and hypsometer) tied up in a sack. This made two light cooly-loads. We did the first 4000 feet on yaks, and then left them to graze on the highest pastures of the Kaying glacier while we attacked the col. On our left ice-slopes at angles varying from 45° to 60° (measured roughly with a protractor) came down from the precipices of Aghalistan Pk. 1 to the very foot of the lower cliffs of Shiwakte I., along which we had to crawl the whole way up. In several places steps had to be cut across tongues of ice running up into clefts in the cliff, and the loads had often to be sent up from hand to hand over difficult bits. Shortly after ten we at last reached the col, and saw away to the left an array of peaks which I afterwards found to be those to the south of the Chimghan Jilgha and its tributary the Tersöze. The Shiwakte peaks were hidden by a jagged black ridge like a row of teeth coming down from Shiwakte I. I spent two hours on the flat top of a boulder taking a complete set of rays and some pictures, and also boiled the hypsometer, which gave a height of 15,230 feet. During this time it unfortunately clouded up,

SHIWAKTE PEAK I. FROM COL ABOVE TIGARMAN SU GLACIER



SHIWAKTE PEAK III. FROM AGHALISTAN

and the Shiwakte group was completely hidden when we descended a small glacier on the south side of the pass and joined, at 13,000 feet, the huge Aq Tash glacier. This took some time, as I made a careful plane-table sketch of all I could see as I went along. Further down we were met by some Qirghiz, who were astonished to see us, but led us hospitably to their two huts and sent word to their headman, Sayat Beg, at his encampment in the main Chimghan Jilgha. This man was very helpful when he came up and gave me a lot of information. Among other things he told me that the Chimghan Jilgha and its branches are rated for revenue purposes at sixty households *; that there are no fir trees in any of them; that the only possible outlet to the Pamirs is over an exceedingly difficult pass, worse even than the Aghalistan, at the head of the Tersöze Jilgha; and that the name "Shiwakte" is used by the Qirghiz of the Chimghan J. for something—whether mountains, pastures, or what I could not quite make out—at the head of their valley.

Owing to the rain and a bad headache I did nothing more that day, and went to sleep at nine on the floor of one of the huts. I was up again at four, and started back for Kaying Bashi at six. I was rather anxious about the weather and afraid of being cut off on the wrong side of the pass, perhaps for weeks, by bad weather and heavy snow. Luckily it had cleared up in the early morning, and though it clouded over again afterwards I was able before it did so to complete my plane-table sketch and secure some fine pictures of the magnificent Shiwakte group, the peaks of which stood round the upper Aghalistan valley in a semi-circle. Never shall I forget the steepness of their sides nor the terrific hanging glaciers that depended from them like vast frozen waterfalls thousands of feet high. The latter feed the Aq Tash (white rock) glacier, so called by the Qirghiz from its remarkable serac, which is visible from a great distance.

Our descent of the pass on the return journey was somewhat exciting. It was warmer than the day before, evidently banking up for heavy rain, and the ice was very soft. The steps we had made the day before had melted, and it was difficult to cut new ones; rocks loosened from the cliffs above came down frequently and had to be dodged; nor was it

* The other divisions of the Qaratash Valley are as follows:

Qaratash, i.e. the main valley above Chimghan Ayaki, 60 households.

Khan Terek, i.e. the main valley and its branches below the big gorge, including Kaying, Chopkana, Yapchan, etc., 30 households.

Terek Kichik (among the mountains on the east side of the Karatash), 100 households.

The revenue paid by the Chimghan Jilgha with its (nominal) 60 households is as follows:

Four *saghins* of cheese, *i.e.* the output of four yak cows in a year; this can be commuted for four *charaks* (1 charak = 20 lbs.) of barley flour.

Forty ropes of camel-hair.

A hundred *charaks* of flour.

Ten yaks or ponies to be lent for transport whenever required.

safe to avoid them by going out on to the steeply pitched glacier, because the thin coating of flat stones and frozen snow over the crevasses might now be insufficient to bear one's weight. As it was, Sayat Beg, who at my request came over with us to investigate some complaint of the Khan Terek Qirghiz, had a narrow escape; he was just in front of me as we filed across an arm of the glacier, when he suddenly disappeared up to his armpits. The *débris* of flat stones which lay on top of the ice formed a support which prevented him sinking further, and we soon fished him out; but, peering down into the hole he had made, I noticed with a slight shudder that Sayat's legs had been dangling over a crevasse at least 20 or 30 feet deep. Near the bottom of the steep part we had to jump off the edge of the glacier on to a steep slope of loose stones, and in doing so started a stone-slide which plunged *under* the snowfield we had just left and went on roaring away underneath for a long time. However, we soon found ourselves safely on the flowery moraine of the main Kaying glacier, where by arrangement a Qirghiz lad was waiting for us with the yaks.

This was the last of my attempts to map the " Alps of Qungur " from the side of the Qaratash Valley. On the way down from Kashgar to India, however, I made an effort to secure a valuable cross-view of Qungur and the peaks at the head of the Tigarman Su and Qurghan Köl Jilghas from the north. On the top of Zor Qir in July 1923 Samsaq Bai had pointed out to me a pass, on the north side of the Gez between the Chakragil massif and Sargalang, called the Arpa Bel. He told me it was regularly used by the local people, and led over from the Gez river near Gez Qaraul to the Oitagh Jilgha, which he said was a very fine valley with fir woods and rich pastures and many inhabitants. As the pass was free from snow and promised the above-mentioned cross-view of Qungur and the Shiwakte, and as no European so far as I knew had visited the forests of the Upper Oitagh valley, I decided to explore it on the way down to India.

This is not the place to describe the remarkable Alpine region we found right under the 14,000-feet precipices of Chakragil—different from but quite as fine as the Alps of Qungur—nor the new alternative route we discovered connecting Tashmalik with the bridge at Gez Qaraul; suffice it to say that we were denied the view of Qungur we had hoped for from the Arpa Bel, for throughout the ten days we were in the Oitagh region the atmosphere remained persistently thick with the fatal dust-haze of Kashgaria.

Marching up the Gez Dara we emerged on September 15 from its terrific gorges, and two days later were camping on the shores of Little Qara Köl in perfect weather. We spent four days in this neighbourhood, during which I visited several of Stein's chief survey stations and took rays from them to the salient points of Qungur and Shiwakte, as well as a number of photographs. My object was to

identify from the opposite side the peaks and ridges I had surveyed from the north-east. I had no difficulty as regards Qungur, but was somewhat at sea as regards the Shiwakte group. None the less, the materials I obtained from this side turned out afterwards exceedingly useful.

On arrival in India at the beginning of November I at once got in touch with the Survey of India authorities, who asked me to take my maps and other material to their Drawing Office at Simla. Here the officer in charge was Major Kenneth Mason, R.E., who has made the cartography of the Pamir region his own. He took the greatest interest in my amateur efforts, which he treated much more seriously than I had expected, spending four whole days on taking over every scrap of my material, plane-table sketches, panoramas, sets of rays and all, and discussing the whole region and the problems connected with it at great length. The amount of work he put into it then and afterwards will be seen from the map and memorandum he has produced specially for this meeting of the Society, and I am more than grateful to him.

NOTES ON THE COMPILATION OF MR. C. P. SKRINE'S TOPOGRAPHICAL MATERIAL IN THE NEIGHBOURHOOD OF THE QUNGUR MASSIF

Major Kenneth Mason, R.E., Survey of India

The material available for the compilation of Mr. Skrine's map consisted of (*a*) Plane-table rays drawn from various points; (*b*) Rough plane-table sketches; (*c*) Enlargements of photographs; (*d*) Clinometer readings to various points; (*e*) Route reports; (*f*) Verbal descriptions. Of these, the greatest use has been made of (*a*), (*b*), and (*c*).

The whole of the area falls in sheet 42 N. In this sheet are only two class A points (fixed by the Pamir Boundary Commission), and no rays were available to these. Of the class B triangulation, that of Deasy observed from the south, and that of Stein based on this work are the most reliable (see *Memoir on maps of Chinese Turkistan and Kansu*, by Sir A. Stein). The first basis of the map is therefore the positions of Little Qara Köl, Subashi, and Shamalda in the neighbourhood of Little Qara Köl lake, and of the peak Qungur I., 25,146 feet, fixed by Stein.

In panoramas IXa., IXb. of *Mountain Panoramas from the Pamirs and Kunlun*, Stein shows the whole south-western face of the Qungur Massif. (These panoramas are reproduced as 3 A and 3 B in the Memoir quoted above.) Comparing the outline of this with the telepanorama taken by Skrine from Kashgar (and with another from Aqsai Davan), almost exactly from the opposite direction, it is possible to identify in both pictures the following points; PK 2/42 N, PK 3/42 N (Chakragil, 22,070, and 21,480); the Gez defile; the whole of the Qungur ridge from this defile to some 6 miles east-south-east of Qungur I. Beyond this point however the outline of the distant mountains from the two positions is no longer the same. The mountain I have shown as Qungur II. is half hidden in Stein's panorama by a great spur sent out in a S.E. direction from Qungur I.; while in Skrine's panorama the highest point is almost, if not quite, hidden by the great dome-shaped massif of Qungur II. itself.

From Little Qara Köl, Qungur II. looks insignificant beside Qungur I.: from Kashgar, Qungur I. looks insignificant beside Qungur II.

It is now possible to examine the observations made from Kashgar to what must have appeared the highest point. Deasy's PK 12/42 N and Trotter's PK 15/42 N are, I am convinced, both attempts to fix the highest point of this great dome.

Deasy's position is 38° 39′ 26″, 75° 21′ 37″;
Trotter's „ 38° 35′ 15″, 75° 22′ 47″.

The former assigns to it an altitude of 23,530 feet, the latter, 25,350 feet. Both observers fixed it from approximately the same point, some 70 miles away. From a subsequent examination of Skrine's photographs, I am convinced, Qungur II. presents a dome over 23,000 feet, 6 miles long from N.N.W. to S.S.E., and 4 miles long from N. to S. Not only did Deasy not observe the same point as Trotter, but I do not believe that either observed the same point at each end of their base. With an enormous ill-defined dome such as this, such a mistake is easily possible.

In view of these considerations PK 12/42 N and PK 15/42 N. have been rejected.

Skrine handed me over a most useful set of plane-table rays to peaks from Toquz Aq Bazar, which place he fixed from Kashgar, and another valuable set from Altunluk, of which the position assigned by Stein has been accepted. The rays from these two points combined with those already drawn from the Little Qara Köl stations—all being set on Qungur I.—gave a series of intersections to peaks, shown on the map as the Shiwakte group, and Aghalistan. From these positions it was possible, by means of other rays, to resect the approximate positions of station 4 and station 5, and to make further intersections. The principle was to draw the rays, ignoring Skrine's identifications; then to compare from photographs and see whether the peaks could exist in those positions. In general, Skrine's identifications, in spite of the difficult nature of the ground, worked out extremely well.

Having obtained positions for peaks, these were identified as far as possible with peaks shown on Skrine's plane-table sketches of the ground, which were then adjusted to these positions, and amplified by close examination of the photographs. The detail is fullest on the south side of and at the head of the Kaying Jilgha, and at the head of the Tigarman Su glacier.

A useful panorama from near Chat gave material for the south-western flanks of Shiwakte II. and IIa., and a telephotograph from the same point seems to indicate a wide basin at the head of the Chimghan Jilgha, probably filled by a glacier, and enclosed by the precipitous face of the southern spur of Qungur II. The Qaratumush valley was filled in from photographs taken near its mouth, and from stations II. and IV. The mouth and head of Pitlik Jilgha, the precipitous spurs and ridges bordering it and the Qaratash, were also drawn in from these latter stations, intersections having been obtained to points on the crest from them and from Altunluk. The ground by Yapchan Jilgha and Chopqana Jilgha is mainly from Skrine's sketches, slightly adjusted to new positions.

The north faces of Qungur II. and Qungur I. are from more distant photographs, taken in conjunction with Stein's work. The Oitagh Jilgha, Arpa Bel, Chakragil area is from a small sketch, a rough verbal description, and from route reports.

The ground in the neighbourhood of the Aqsai Davan is based on Stein, altered to Skrine"s notes.

The heights throughout are rough. They are based on aneroid, boiling-point, and clinometer readings.

Qungur I. is the only peak that can be said to be fixed for height.

The height of Qungur II. is based on the following considerations. Deasy's rays to his Pk. 12, if produced to the newly assigned position of Qungur II., give 25,100; Trotter's position is almost the same range from Kashgar as the new position; his height is 25,350: the average of clinometer readings of Skrine from three different points gives 25,200; the height obtained from Sir Aurel Stein's panorama from Qara Köl lake makes it 25,050.

I have assigned 25,200, believing it to be slightly higher than Qungur I.

The remaining heights of Skrine are to the nearest 100 feet, and may be taken to have a probable error of 300–400 feet.

The following alterations have been made in the map of Stein:

(*a*) Oitagh Aghzi at the mouth of Oitagh Jilgha is moved 3 miles south.

(*b*) Langar is moved 3 miles south.

(*c*) Crow-fly distance between Langar and Achiq Jilgha mouth is shortened by 3 miles.

(*d*) Crow-fly distance between Achiq Jilgha mouth and Altunluk is lengthened by 4 miles.

(*e*) Adjustments to position of Chakragil peaks and Sargalang, to fit in with Skrine's plane-table rays. I am convinced these fixings of Deasy from Kashgar, being very acute, admit this adjustment.

(*f*) Insertion of Qungur II. massif.

(*g*) Insertions of Qurghan and Tigarman Su glaciers and corrections of detail.

(*h*) Insertion of detail of Yapchan, Chopqana, Kaying, and Qaratumush Jilghas with their glaciers and peaks.

(*i*) Extension of Terek Kichik and Pitlik Jilghas and the insertion of detail to the south of the latter.

(*j*) Corrections of the direction of the Chimghan Jilgha with the branch Tersōze Jilgha.

(*k*) Chimghan-ayaki is 1½ miles south and 4 miles west of the position given it by Stein.

Skrine's explorations fill in several important blanks in our knowledge of the eastern flanks of the Qungur massif. They give a very good picture of the "peripheral gorges of the Pamir plateau," and while emphasizing the difficulties of the ground, reveal a certain amount of vegetation and habitation of which we previously had no knowledge whatever. Separate communities living in the different jilghas can only communicate with each other by difficult passes, and frequently such intercourse is interrupted altogether.

One of the outstanding features of the exploration is the further evidence of the existence of Qungur II. Its great featureless dome has been the cause of uncertainty for years. Its height is not yet settled, but we know now that it competes with Qungur I. for the post of the highest point of the Pamirs.

NOTE ON THE PLANTS COLLECTED BY MR. SKRINE

W. B. Turrill, M.Sc., F.R.S., The Herbarium, Kew

The collection, though small, indicates that the flora, taken as a whole, is distinct from that of the Himalayas and belongs, indeed, to the Central Asian Region. The most striking feature is the number of plants limited either to

Turkistan or to this country and the immediately surrounding districts. These Central Asian endemics give the flora a facies of its own, and, since they are often very distinct species, suggest a long period of uninterrupted floristic development. On the other hand, it is interesting to note the occurrence of several species which have a very wide distribution over the whole of the North Temperate Regions. It is impossible to suggest the locality of origin of these from a study of their present distribution alone.

Before the paper the PRESIDENT (the Earl of Ronaldshay) said: Our lecturer this evening, Mr. Skrine, in the course of his official duties as a member of the Indian Political Service, has been fortunate enough to obtain opportunities of visiting an absolutely unknown piece of Central Asia. Mr. Skrine, when the war broke out, found himself a member of the Indian Civil Service, and, being active, enterprising, and patriotic, he made strenuous endeavours to join His Majesty's forces. Circumstances preventing him from doing that, he did what seemed to him to be the next best thing with a view to getting to the scene of action, that is to say, he joined the Indian Political Department, and in that capacity he first went to Eastern Persia, where he had many chances of studying that part of the country during the war. Subsequently he was sent as our representative to Kashgar, and being anxious to do what he could to further the cause of geography he obtained permission to visit the mountains of Qungur, the meridional chain which lies from north to south between the main systems of the Himalayan Mountains and the Tian Shan ; and it is this hitherto unvisited range that Mr. Skrine is going to describe to-night. I might add that he has a long tradition of Indian service behind him, for he is the son of an eminent member of the Indian Civil Service who, as I happen to know from personal knowledge, is still remembered with feelings of affection by the people of Bengal. Our lecturer this evening is also an extraordinarily competent photographer, and he will be able to show us views of these unknown mountains and valleys in the heart of Central Asia which have been described to me by those who have already seen them as some of the finest photographs of mountain scenery which it is possible to see. We look forward, therefore, with feelings of most pleasurable anticipation to Mr. Skrine's lecture, and I now have pleasure in asking him to proceed with his narrative.

Mr. Skrine then read the paper printed above.

The PRESIDENT: Is there any one present who has been in the neighbourhood of the country we have seen to-night? If so, I would be glad if any volunteer would say a few words. . . . It appears that there is no one present who has any personal knowledge of the neighbourhood. The thing that struck me about the photographs, a point which Mr. Skrine himself emphasized, was the extraordinary similarity between the valleys of this hitherto unvisited meridional range and the valleys of the Tian Shan Mouutains which lie very much farther north. The part of the Tian Shan which I know lies in the neighbourhood of Kuldja on the Chinese frontier, which must be some 200 or 300 miles north-east of the actual mountains of which Mr. Skrine has shown pictures this evening, and the pictures which he showed us, both from the contours of the mountain, the flora, and even from the people themselves, might have been taken in the Tian Shan round about Kuldja. The mountains there are inhabited in the same way by those wandering Kirghiz tribes, and throughout the valleys which I know there are the same trees which Mr. Skrine

PAMIRS

QUNGUR MASSIF

from a Survey by

C. P. SKRINE, I.C.S.

1922-24.

Scale 1/250,000.

5 0 5 Miles

— Reference. —

Perpetual snow — Conifer woods

Route — Heights in feet

— Note —

This map is a reduction of the compilation made by the Survey of India from Mr Skrine's surveys, supplemented by, and adjusted to the surveys of Sir Aurel Stein, K.C.I.E., and other material. For further information on its construction see Major Kenneth Mason's note following Mr Skrine's paper in the Geographical Journal for Nov. 1925.

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QUNGUR MASSIF
Skrine

75°
15'
At Oitash Jilgha
Oitagh Jilgha
Agh Aghzi
Pilal
Arpa Aghzi
Chikir J.
Bilil Ush
Oi Tagh Gl.
Sargalang
14900
22070
Chakragil
21480
Arpa Bel
13350
Gez Defile
Gez Qaraul
Qurghan Jilgha
45'
Khapa Gumbaz
Tarning Bashi
(Langar)
Bulun Köl
Tigarman Su
QUNGUR I.
25146
Qungur Glacier
Qurghan Glacier
17100
Tigarman Su
17700
QUNGUR II
25200
Shiwakte Group
20400
IV
IIIª
III
Aq Tash
20500 II
20200 IIª
Kok Sel Glacier
Qizil Sel Glacier
22000
Unexplored
Shiwakte
(Stein)
38°
30'
Basik Köl

15'
30'
45'
Oitagh Jilgha
Agh Aghzi
Pilal
Arpa Aghzi
Sargalang
14900
Arpa Bel
13350
Kupruk Qaraul
Aqsai Davan
9400
Gez Defile
Langar
Gez Qaraul
Qurghan Jilgha
Saman
QARATASH
Achiq Davan
Achiq J.
Qurghan
Khan Terek
Yapchan Jilgha
Ayagchi Jilgha
Zor Qir
Bele Tik
Bozarga
At Bel
12000
Tigarman Su
Yapchan Yailaq
Chopkana Jilgha
Kok Choka
Kökdong
16800
Yelpaktash
13900
11400
Kaying Bel
13050
12750
Tugene Tar Gorge
Terek Kiz
Qurghan Glacier
Tigarman Su Gl.
15600
Sarigh Yon
15300
Kaying Aghzi
17100
Tigarman Su
17700
QUNGUR II
25200
Torbashi Gl.
Kaying Bashi
Pitik Jilgha
Shiwakte Group
20400
19400
Kaying Gl.
Zumurrat
15230
Kepek P.
Aq Tash Glacier
Sel Glacier
22000
20500 II
20200 II
Ghorumba Gl.
16800
Qaranumush J.
Sel Glacier
Unexplored
18000
17000
Qaramush Gorge
Chimghan Jilgha
Shiwakte (Stein)
Jilgha


PAMIRS
QUNGUR MASSIF
from a Survey by
C. P. SKRINE, I. C. S.
1922-24.
Scale 1/250,000.
5
0
5 Miles
— Reference. —
Perpetual snow
Conifer woods
Route
Heights in feet
— Note —
This map is a reduction of the compilation made by the Survey of India from Mr. Skrine's surveys, supplemented by, and adjusted to the surveys of Sir Aurel Stein, K.C.I.E., and other material. For further information on its construction see Major Kenneth Mason's note following Mr. Skrine's paper in the Geographical Journal for Nov. 1925.
Yelganart
Altunluk
Mughal Ere
Aqsai Davan
9400
QARATASH RIVER
Saman
Achiq Davan
Achiq J.
Qurghan
Khan Terek
Yapchan Jilgha
Ayagchi Jilgha
Chopkana Jilgha
Bozarga
Yapchan Yailaq
Kok Choka
Yelpaktash
13,900
11400
Kaying Bel
13080
12750
Tugene Tar Gorge
Terek Kichik Jilgha
Kaying Aghzi
Kaying Bashi
Pitik Jilgha
15500
Qaratumush J.
16800
Qaratash Gorge
18,000
17000
Ghez Mts
Aral Sea
Balkhash L.


Gez Defile
Gez Qaraul
Qurghan Jigha
Khapa Gumbaz
Tarning Bashi
(Langar)
Bulan Köl
Tigarman
Qungur Glacier
QUNGUR I.
25145
QUNGUR II
25200
17100
Tigarman Su
17700
Shiwakte Group
20400
III
IV
20500 II
20200 II
Kok Sel Glacier
Qizil Sel Glacier
Unexplored
Shiwakte
(Stein)
Basik Köl
Little Qara Köl
21160
Shamalda
Qaratash Pass
45'
38
30'
75.
15'

Published by the Royal Geographical Society

PAMIRS

QUNGUR MASSIF

from a Survey by

C. P. SKRINE, I. C. S.

1922-24.

Scale 1/250,000.

5 0 5 Miles

— Reference. —

Perpetual snow ..... Conifer woods .....

Route ..... Heights in feet

— Note —

This map is a reduction of the compilation made by the Survey of India from Mr. Skrine's surveys, supplemented by, and adjusted to the surveys of Sir Aurel Stein, K.C.I.E., and other material. For further information on its construction see Major Kenneth Mason's note following Mr. Skrine's paper in the Geographical Journal for Nov. 1925.

Saman

Qaratash R.

Achiq Davan

Achiq J.

Qurghan

Khan Terek

Bele Tibi

Bozarga

Yapchan Jilgha

Ayagchi Jilgha

Chopkana Jilgha

Yapchan Yailaq

Kok Choka

Yelpaktash

13,900

14400

Kaying Beh

13050

12750

Tugene Tar Gorge

Terek Kichik Jilgha

Kaying Aghzi

Kaying Bashi

15800

Pitlik Jilgha

Qaratumush J.

16800

Ghorumba Gl.

Qaratash Gorge

18000

17000

M t s.

Chimghan Ayaki

10160

Ghijaq Davan

Bek Targhak

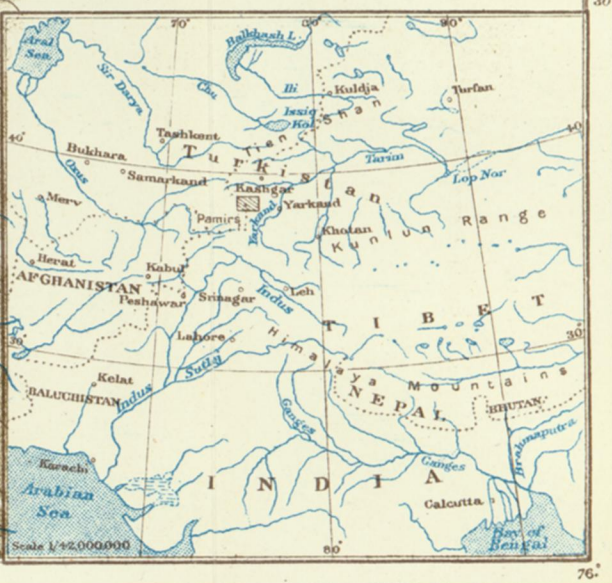
Chat

Qaratash Jilgha

45°

76°

38°30'



QUNGUR MASSIF

Skrine

described as the Tian Shan fir, which is much like the Wellingtonia in appearance. That is very interesting, because this range described to-night is really much nearer to the Himalayan system, and it must be, as Mr. Skrine ventured to explain, that this curious characteristic is due to the fact that there is between the Himalayan and the Kungur range such an enormous wall of mountains as to prevent the interchange of flora. I think you will agree with me that what I said with regard to Mr. Skrine's photographs before he showed them to us was none too high praise. They do indeed constitute a most magnificent series of mountain photographs, and they show, above all, that Mr. Skrine himself took an immense amount of trouble in selecting the sites from which to take the different views. Mr. Skrine has also shown that, in spite of the fact that his early training in map-making consisted merely in plotting out a nine-hole golf course in the United Provinces, he must have proved an extraordinarily apt pupil, because the map which he showed us to-night, though it was compiled by a member of the Survey of India, was all based upon the excellent material which Mr. Skrine himself provided. And as long as Englishmen are prepared to spend such leisure as they are able to snatch from their ordinary daily duties in exploring the unknown places of the Earth in the way that Mr. Skrine has shown that he has done, so long, I think, will the English race remain pre-eminent as the pioneers of the world. May I express to Mr. Skrine the gratitude of this audience for the treat which he has given us to-night, and at the same time convey to him our hopes that in the course of the duties which may lie before him in the future he will find similar opportunities for exercising those talents which he has shown us he possesses in so eminent a degree.

UHA IN TANGANYIKA TERRITORY

Capt. C. H. B. Grant

UHA lies approximately between 3° and 5° S. latitude and 29° 40′ and 31° 15′ E. longitude, to the north of the Central Railway line, within the administrative district of Kigoma. From 1921 to 1924 I was in charge of the Kasulu Sub-District, and for a time of Kibondo Sub-district also. These Sub-districts comprise Uha, the former being divided into three Sultanates, Heru, Ushingo, and Luguru, and the latter into two Sultanates, Buyungu and Muhambwi. The largest river is the Mlagarasi, which, starting from near Lake Tanganyika, goes northwards, and taking a bend south and west enters the lake some distance below Ujiji. All the waters of the Kasulu Sub-district, except for one basin that drains direct into the Lwiche, and of the southern part of Kibondo Sub-district, fall into the Mlagarasi. Kibondo Sub-district is badly watered compared to the Kasulu Sub-district. There the mountains of Heru are intersected with innumerable perennial streams and rivers of cool, clear crystal water, rising mainly in bare open grassland. These highlands were said to be covered in forest, the haunt of elephant, buffalo and other game, before the advent of the Watussi. Even during

NOTE ON A PORTION OF THE TSANGPO

Major F. M. Bailey, C.I.E.

IN returning from a short visit to Lhasa in the summer of 1924 with Major Hislop of the Indian Medical Service, I had an opportunity of using a little-known road and also of completing by a rough prismatic compass traverse the survey of about 50 miles of the Tsangpo between the point our surveyors were able to map during Sir Francis Younghusband's Mission in 1904, and Tsetang, the point up to which Major Morshead surveyed it in 1913.*

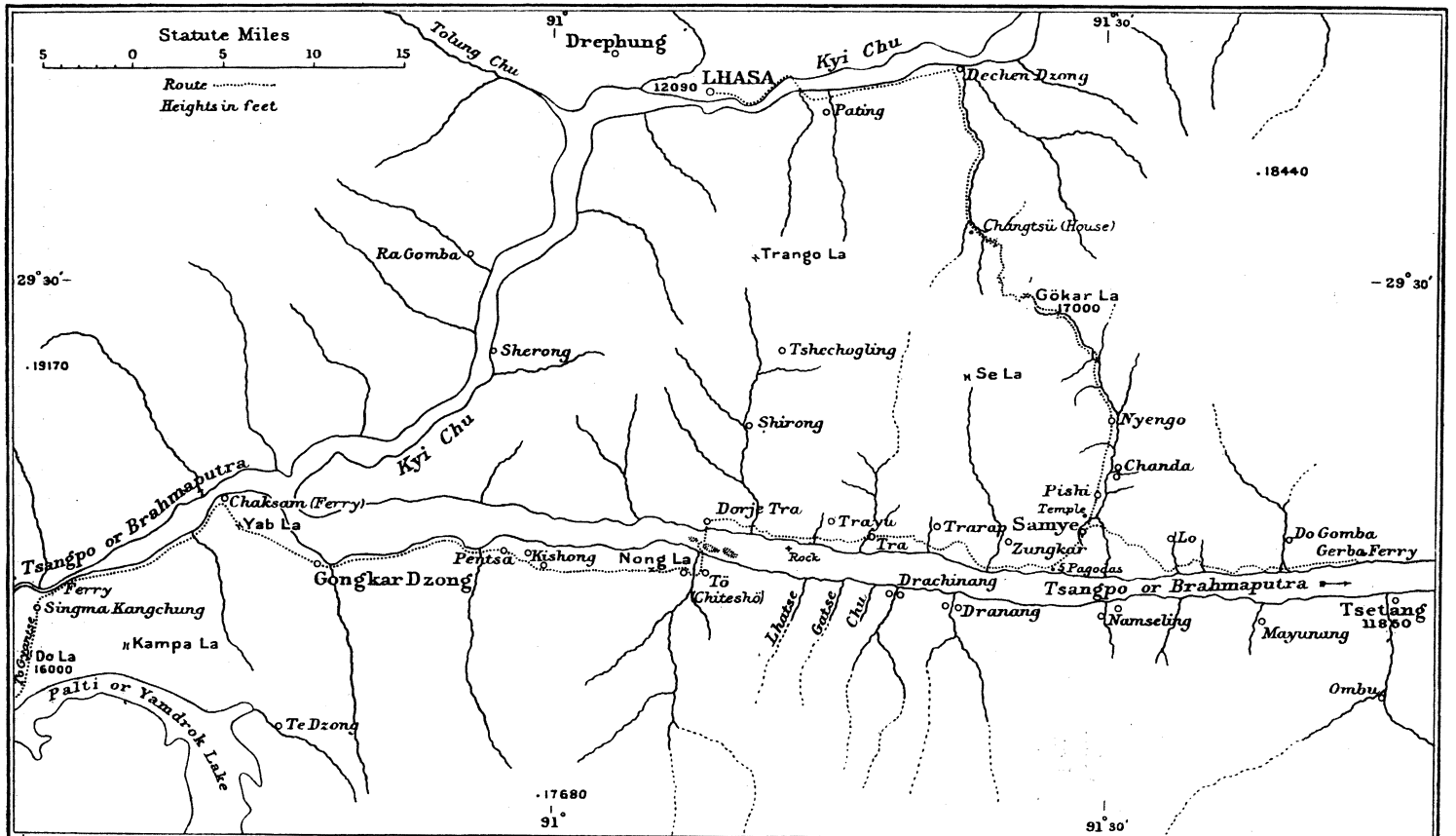
Leaving Lhasa on August 16, we travelled up the right bank of the Kyi Chu for some 4 miles, when the river was crossed to the left bank in skin coracles. The river was in heavy flood and was dangerous for ponies, which were obliged to swim. The ponies are held up and guided by men who cross in the coracle. One of my best ponies, well known in the Darjeeling racecourse, got loose and was nearly drowned, but managed to get on to a shoal in mid-stream, where he stood until rescued.

We left the valley of the Kyi Chu near Dechen Dzong, and going south up a valley, we camped under a cypress tree at a house called Changtsü. The next day we crossed the Gökar La ("White Vulture Pass") at an altitude of 17,000 feet. On the road were wonderful primulas, presumably wild hybrids, for in one clump they were to be found of every colour from pure white, through yellow to deep crimson, the most striking being a clear grey. Other beautiful flowers were blue larkspurs of several varieties, some large-flowered ones being near the summit of the pass among patches of snow. We also passed fine but deadly aconites and patches of yellow and crimson pedicularis and a yellow clematis which is common at Lhasa.

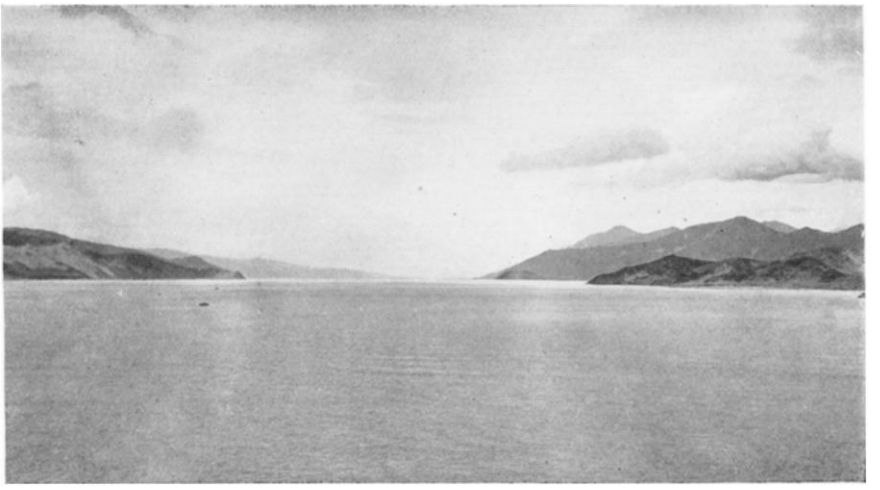
At the pass we entered the valley of a stream which flows into the Tsangpo. As we descended the valley the forest became thicker and thicker, and we were told that it contained stags, leopards, and Harman's pheasants, though travelling down the road we saw no signs of these. To judge by the vegetation, it would seem that the valleys joining the Tsangpo receive a much larger quantity of rain than the actual Tsangpo itself. In 1913 we noticed houses with pent roofs of pine shingles within a few miles of the dry valley where all houses had the usual flat mud roof of Tibet.

A march of 22 miles from Changtsü brought us to Samye. This is an ancient and famous monastery connected with the visit of Guru Rimpoche (the Indian saint, Padma Sambhava), who converted Tibet and Bhutan to Buddhism in the eighth century. On the hill above is a hermitage in which he lived for some time. I said I had not time to visit it, and was

* Note by Ed. *G. J.* The explorer A. K. had of course traversed and roughly mapped the whole of this section on the southern bank in 1882.

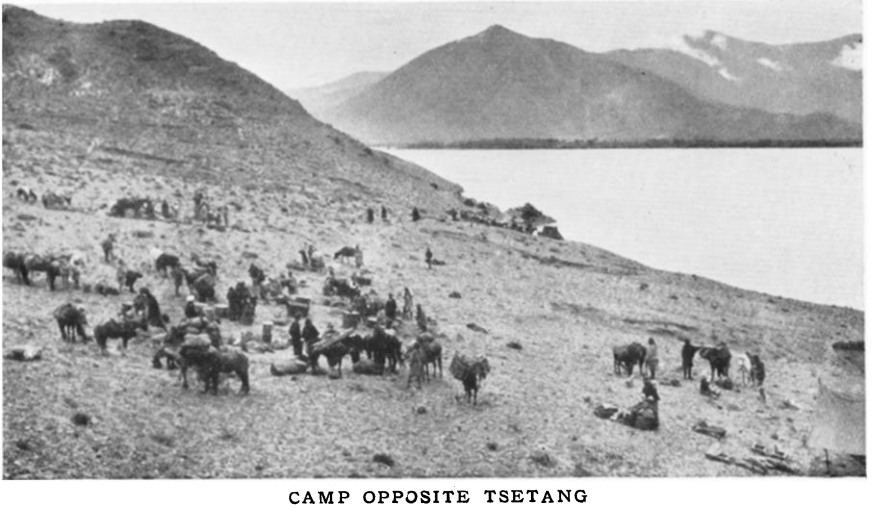


Sketch-map of a part of the Tsangpo to illustrate Major Bailey's note.



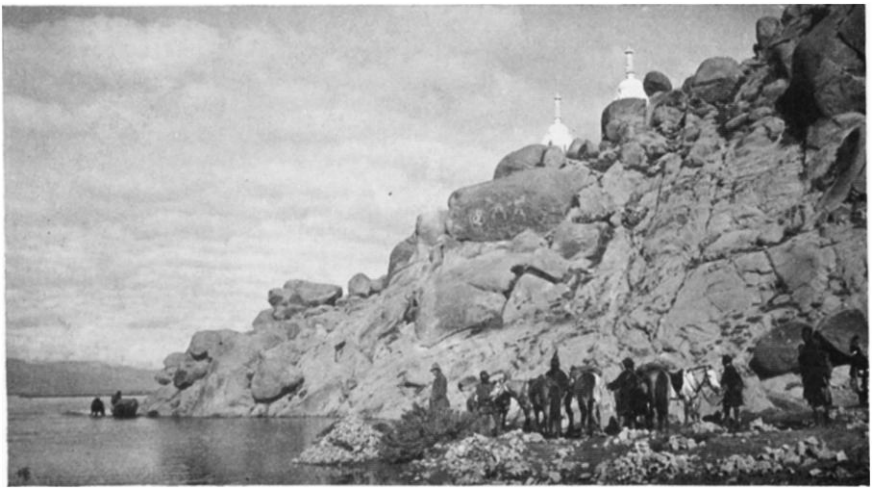
THE TSANGPO, LOOKING UPSTREAM FROM NEAR SAMYE

SAND-DUNES NEAR SAMYE



CAMP OPPOSITE TSETANG

THE TSANGPO, LOOKING UPSTREAM FROM BELOW DORJE TRA



ROAD THROUGH RIVER BELOW GURU RIMPOCHE'S FINGERS

THE TSANGPO, LOOKING DOWNSTREAM FROM NONG LA

told that to visit Samye without visiting the hermits' caves was like buying a coat without a collar.

The main temple is in three stories supposed to be in Chinese, Tibetan, and Indian styles. At each corner is a coloured *chorten*, or pagoda, white for good, black for evil, red for fire, and green for water. The whole is surrounded by an oval wall on which are a thousand *chortens*. There is one temple into which the breath of every person who dies in the whole world passes at the time of death. The small cross-pieces of the roof are all swords and spears—there must be thousands of them—while outside are three swords each 25 feet long.

A day's journey down the Tsangpo over miles of tiresome sand-dunes brought us opposite to the important town of Tsetang, which Major Morshead and I had visited in 1913. The river was so high that no boat could cross to reach us, and we had to spend an uncomfortable night on a bare hillside with no food for our animals, while across the river, tantalizingly near, was the town among willow trees and crops.

Being unable to cross the river, we were obliged to return up the left bank, an unpleasant, hot march over sand. In winter the road is easier, as it goes over the river-bed instead of over sand-dunes.

We spent a night at Samye, and then continued our march up the left bank.

Soon after leaving Samye we passed five white *chortens* on a rocky spur which ran down to the river's bank. About these we were told the following legend: Guru Rimpoche was coming to Samye, and at this point the king of Tibet met him. At the meeting the king said, "As I am king of the country no one is greater than I," and he refused to salute the holy man. Guru Rimpoche said, "I am a saint, and so superior to all mortals," and he refused to salute the king. Being angry with the king for his arrogance, he produced fire from his five finger-tips and burnt up the king's clothing. The now naked king fell down and worshipped him, saying, "You are indeed a god." Guru Rimpoche was then filled with remorse at his own display of pride and anger, and as a penance he erected the five white chortens, one for each of his fingers out of which he had produced the fire.

Our road was much the same as before: stretches of sand alternating with rocky spurs or steep sand-banks jutting into the river.

About 13 miles from Samye we came to a village called Tra, where the eye was relieved by green crops and willow groves. The hills up the valley appeared to be thickly wooded, and were, we were told, the haunts of Harman's pheasants. Five miles farther we passed a very striking conical rock sticking up in the river, which formed a very useful landmark. It was said to have been floating down to India, but was stopped by Guru Rimpoche. About 5 miles farther we reached the monastery of Dorje Tra, built against a cliff, where we spent the night. This is an important ferry where there was one wooden and several skin

boats. We ourselves crossed in leather boats; the crossing took one and a half hours. When nearing the south bank we had to work our way through many sandy islands, which delayed us. In winter these islands are part of a wide stretch of sand, and the crossing is much shorter. We made a delightful camp on turf under willows at the village at Tö, or Chi-te Shö. The people had never seen a European, and were very curious to see what we were like.

Our ponies were crossing in a wooden boat, which had to go for a long way down and be pulled up past the islands to the end of the Nong La spur, which was the only place where they could be landed. They did not reach there till the next day.

On August 22 we marched 20 miles up the south bank to Gongkar Dzong. From a spur of the Nong La, 400 feet above the river, we had splendid views of the broad valley both up and down stream. We descended and continued up the flat valley. There were numbers of Bar-headed geese on the river-bank, which were so tame that I was able to get some photographs of them.

The next day I visited the Dzongpen of Gongkar. In 1904 he had been one of the Garpons, the officials at the Gartok trade mart in Western Tibet. We had met when I went there with the late General Rawling, Colonel Ryder, and Colonel Wood of the Survey of India.

Six miles from Gongkar we crossed the Yab La, a spur about 500 feet above the river. At the end of this spur is the ferry of Chaksam, where the expedition under Sir Francis Younghusband crossed the Tsangpo in 1904. We were now on well-known ground. We camped the night at Singma Kangchung, whence we telephoned to His Holiness the Dalai Lama to tell him we had rejoined the main road.

When in Lhasa the Tsarong Shape had asked me about the possibility of using motor boats on the Tsangpo, and at his request I measured the velocity as well as I could in some of the more rapid places and found it to be between 5 and 6 miles an hour.

We returned to Gyantse by the usual road *viâ* Nangartse, the Karo La, and Ralung.

THE ROUNA FALLS OF PAPUA

T. J. Lindsay Dowsett

SOME 23 miles from Port Moresby, the seat of Government in the Territory of Papua, are the Rouna Falls,* which for beauty, picturesque surroundings, and prospects of immediate economic

* We retain the spelling used by Mr. Dowsett, which is that usually adopted on maps. It does not seem certain however whether the vowel sound in the first syllable is diphthongal ("Ro-una") or whether "Rona" or "Runa" would be the correct spelling according to the R.G.S. system.

about their country. So that, while there is something here for those who care to ramble in an uncritical spirit along historical by-paths, there is for the geographer very little except some gleanings from a short section on Architecture (pp. 78–85), illustrated by Plates I., V., and VI. This is a pity, because Mr. Osmond's photographs are excellent, and he has adopted the excellent practice of intensifying illustration without prejudice to economy by showing some thirty snapshots on eight plates. One feels that he might have done a good deal to vivify our rather vague ideas of a not very well-known region, just as he has illuminated the equally little-known game of *pelota*. But he ought in the future to avoid references such as that on page 2 to " The barren basin of the Ebro which actually seems to kill the vegetation along its banks." To the human geographer this appears an unseemly levity exhibited on the very threshold of a classic region of canal irrigation.

He would have been better advised also to regard the problem of the origin of the Basques as outside the scope of a work of this kind. R. A.

ASIA

Fifty Years in China. The Story of the Baptist Mission in Shantung, Shansi, and Shensi, 1875–1925.— E. W. Burt, M.A. London: The Carey Press. [1925.] 7 × 4½, pp. 127. *Illustrations.* 2*s. net.*

The interest and the value of this modest little volume of 120 odd pages are by no means to be measured by its size. Much of the matter, more especially in the earlier chapters, is exceedingly timely in view of present conditions in that distracted country. In the account of the intercourse between the mission workers and the student and merchant classes in the inland towns much light is thrown on the mentality of people far removed from the centres of foreign trade at the seaports and larger cities primarily affected by the present outbursts of hostility—directed mainly, it is to be noted, against the British community as a whole. The work of the Society with whose activities the volume is primarily concerned, is rightly viewed as an integral component in the age-long impact of Christian intercourse upon China, and the book therefore begins with a useful outline of the successive stages by which Western religious activity has been brought to bear on China from quite early times—a story well known to students of Chinese history, but less so to the general reader. It may suffice to recall here that the existence of Christians in China in his time is mentioned by the Christian historian Arnobius, who wrote before 300 A.D.; that the results of the Nestorian activities are recorded by the famous monument still standing at Si-an-fu; that the devoted and energetic John of Montecorvino, though already fifty years old when he reached China about 1292, succeeded during his thirty years of labour there in translating the Psalms and Gospels into Chinese, and is said to have himself baptized 30,000 converts; and that a new period of zealous missionary work by a devoted band of Jesuits was ushered in towards the close of the sixteenth century by the arrival of that remarkable man, Matteo Ricci, who by his gracious personality, culture, and scientific attainments found almost equal favour with the Imperial Court and the common people. In each of these episodes the teachers were welcomed, and their efforts for a time crowned with considerable success: in each case, sooner or later, their converts were almost extirpated by ruthless persecution.

The modern chapters of the story open with a brief note on the arrival of Robert Morrison in 1807, to begin work under the auspices of the London Missionary Society. For many years he was refused admission to China

proper, and settled in Macao. There, as translator to the "Honourable East India Company," he produced a Chinese dictionary which was published by the Company at a cost of £15,000. Morrison also translated the Bible into Chinese, though he was able to accomplish but little direct evangelistic work, and died in 1834. It was for others to enter into the fruits of his labours.

This is not the place for a detailed account of the work of Christian propaganda carried on by the Baptist Missionary Society since its operations were initiated in 1875 by Dr. Timothy Richard. But mention should be made of the extraordinary part played by him as leader of relief work during the "Great Famine" of 1877, principally in the province of Shansi. Not only did it evoke the gratitude of the people affected, but in an official Consular despatch to the Foreign Office, it was remarked of Richard and his colleagues that any one who had seen the lives they were leading must be proud of being able to claim them as countrymen.

The writer of a recent leading article in the *Times* remarked, apropos of the slaughter of 2000 Chinese villagers in Fukien because some of their number had ambushed the party sent by a local bandit leader to collect the illegal opium tax, "The Boxer spirit slumbers, but is by no means dead." In this book, chapter xi., a vivid account is given of the inception of the "Boxer" movement as the sequel to the murder in 1898 of two German missionaries in Shantung, and the punishment of the governor of that province at the demand of the German Minister. The whole of the English members of the Baptist Mission in Shantung, together with their families, were murdered in cold blood, a fate shared by large numbers of British and other missionaries elsewhere. W. W.

Cambodge et Cambodgiens : Metamorphose du Royaume Khmer par une Methode Française de Protectorat.— Paul Collard. Paris : Société d'Éditions Géographiques, Maritimes et Coloniales. 1925. 10 × 8, pp. x. + 312. *Numerous Illustrations and a Map. Frs.* 40.

This comprehensive and important work is a companion to Colonel Maurice Abadie's 'Les Races du Haut-Tonkin' (reviewed in the *Journal* of February 1925), and has the laudable object of making the French public better acquainted with "la plus intéressante de nos possessions de l'Indo-Chine." This M. Collard is as well qualified to do as any man living, for he has had twenty-seven years' administrative experience in the rich country fertilized by the Mekong, which he aptly describes as "le Nil Cambodgien." After an historical outline, he deals with ancient Khmêr literature and annals, and with various aspects of the life of the Cambodians, whose distinctive characteristic is, he tells us, passivity : in a land where the lakes and rivers teem with fish, and where rice grows almost without cultivation, owing to the marvellous fertility of the yearly flooded soil, it is not strange that they should be unambitious. They are a race which has remained exceptionally pure, a race with a splendid past. "Des ruines . . . voilà tout ce qui resterait, sans Angkor-Vat, de la grande passée des Khmêrs." But he believes that under French protection they have before them a splendid future, and his main purpose is to show what French Colonial Administration has done for Cambodia since the Convention between the two countries was signed in 1884. He himself has seen a patient and tractable people freed from the oppression and misgovernment of its former rulers, and the main part of his work is to show how the butterfly is emerging from its chrysalis, assisted by French Colonial officers. His account is necessarily a partial one, but to support his contention that the present *régime* is a success he quotes Lord Northcliffe's remark (a characteristic