

The GEOGRAPHICAL JOURNAL

Vol LXXIV No 3



September 1929

THE ALAI-PAMIRS IN 1913 AND 1928: *A paper read at the Evening Meeting of the Society, 29 April 1929, by*

W. RICKMER RICKMERS

THE term Alai-Pamirs covers the mountainous regions between the Amu Darya, the Sir Darya and the Chinese border. Hence it applies to the Pamir block and its westerly fringes. In accordance with political frontiers one might also speak of the Russian Pamirs.

Besides having acquired a definite morphological meaning (a pamir—a valley of the Pamir type), the Pamir has become very elastic in a topographical sense, not to speak of the plural which appears to be of English origin. Khargush Pamir, Alichur Pamir are divisions of the whole (that part of the Pamir called Hare Pamir) like West London or South London. The Londons would therefore correspond to the Pamirs. We observe a transition from place-name to general term. It reminds me of a Russian peasant who once asked me: "Is your Volga as big as ours?"

Comparing the map in W. Geiger's book ('Die Pamirgebiete') published in 1887 with "The Pamirs" of the Survey of India (Sheet 42) reprinted with corrections in 1922, one is at once struck by their similarity. What one may call the small-scale features of the Pamirs (including the Alai and Bukhara) have undergone practically no change during the last forty years. Thus, apart from the more exact determination of heights and astronomical positions, the map of the Pamirs is now one for filling in detail. It may therefore be taken as an example of the step from extensive to intensive cartography.

The old Russian survey of 10 versts to the inch (1 : 420,000) has served as the foundation or framework for every subsequent map of the Pamirs. As time went on more or less sketchy improvements were added in irregular patches. Without exception this new topography had to do with inaccessible mountains, inaccessible that is to say from the military surveyor's point of view, for he had to work with a certain rapidity in order to finish the map of Russia's newly acquired possessions in Turkistan. Eating his way through the cake he struck hard objects in the shape of clusters or chains of peaks, glaciers, and gorges. Even had he been a member of the Alpine Club he could not have wasted time on these lumps of last resistance, for army and administration wanted to know as quickly as possible about all the places where war could be

waged and taxes levied. By a process of natural elimination the glacier districts were left over for the mountain explorer.

Considering its age, purpose, and speed of publication the old Russian map is really very good. Plains, rivers, villages, roads, and passes are shown with reasonable exactitude. In other words, the map is reliable where a horseman can travel. We have the arterial system of the rivers and everything it entails in the way of life, settlement, and trade. Hence the map nowhere shows considerable tracts of totally unexplored country. To make up for this, nearly the whole of the mountain skeleton between the river ramifications is, so to speak, imaginary. The unexplored orography is dovetailed into the known hydrography, so that for a re-survey of the mountains the whole ground has to be gone over again.

The filling in of mountain detail by Russian, British, French, and German travellers has never ceased during the last forty years. Yet such is the wealth of this detail that even the revised sheets of the 10-verst map still convey the same general impression. Unfortunately, it is difficult to distinguish fact from fancy because the old surveyor was possessed by a horror of the void. His aesthetic sense apparently revolted against white patches. These he peopled with contorted caterpillars created partly from hearsay, partly from his inner consciousness. A few larger areas, however, he tinged a lighter yellow, notably around the headwaters of the Bartang, Yazgulam, Vanch, and Khingab, on both sides of the Muk Su, and in Qarategin north of the Surkhab. These then are the big "white patches" of the Alai-Pamirs.

Let it be understood that I hold the Russian surveyor and traveller in high esteem. Knowing absolutely nothing about mountaineering, Mushketov in 1880 crossed the Macha pass at the head of the long and difficult Zarafshan glacier. In 1904 Korjenevski fought his way through the dangerous gorge of the Muk Su. I only mention these two out of innumerable feats generally accomplished with poor equipment and very little money.

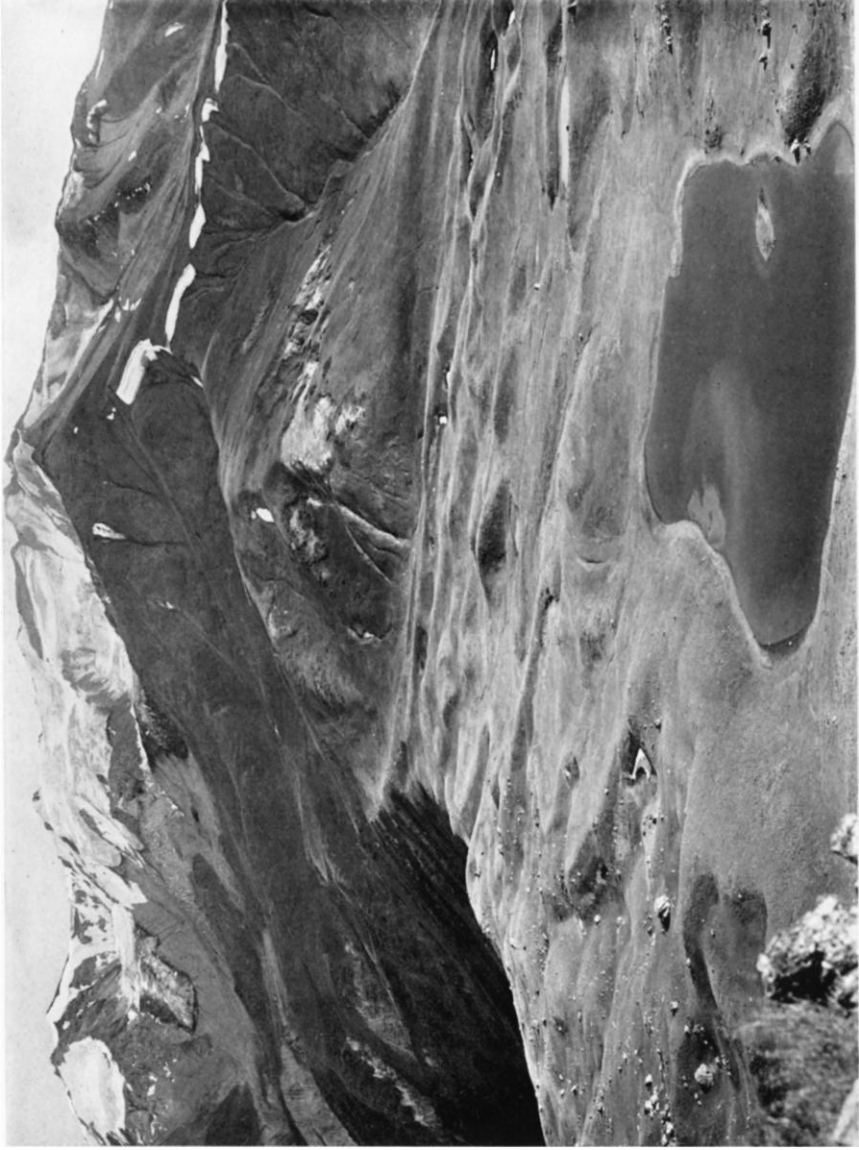
This not being the place for a long history and bibliography, I may be allowed to lead up to 1913 and 1928 with my own work as illustrating the progress of mountain exploration in Russian Turkistan. After my first visit to Bukhara in 1894 I gradually moved eastward, attracted by the cream-coloured patches of Eastern Bukhara and the Western Pamirs mentioned above. An unwieldy and forgotten volume gives the condensed results of my wanderings up to 1912 (*'The Duab of Turkestan'*: Cambridge University Press, 1913).

The two expeditions which form the subject of this paper are separated by fifteen years, but connected by the same fundamental idea, namely the exact survey of certain mountains. During the interval very little happened in a region which, in my innermost heart, I had reserved for myself. On the other hand, something had happened which allowed me to visit the Pamirs which a former government had closed to foreigners since Filchner's military speculations.

In 1913, when I led the expedition of the German and Austrian Alpine Association, the late Dr. Deimler made a photogrammetric survey of part of Qarategin and more especially of the Range of Peter the Great. After Dr. Deimler's early death Dr. von Gruber prepared two maps from the negatives,



Morainic landscape of Tupcheq



Moraine shelf of Little Tupcheq: on left Baisirek valley, eroded later

one showing the Barolmas and Qizil Su glaciers in great detail on a scale of 1 : 50,000 (*Zeitschr. für Gletscherkunde*, xiv, 1926). The other is a "Kammkarte," i.e. a ridge-map of Qarategin on which the lower valleys are not shown (*Zeitschr. d. Ges. f. Erdkunde*, 1925).

In 1928 Dr. R. Finsterwalder surveyed about 4000 square miles of mountains and glaciers between the Sel Tau, Trans-Alai, and Zulum Art ranges and the Tanimas river. The completion by stereoautograph will, of course, take some time. I think I may predict a great stride in automatic cartography. It would be unfair to compare Deimler's and Finsterwalder's maps on the lines of merit. In 1913 photogrammetric surveying was still in its infancy. According to present-day standards Deimler's quarter-plate apparatus was fairly primitive. Moreover he had to work single-handed. Finsterwalder and his assistant Biersack used a set of the most modern half-plate photo-theodolites by Zeiss. Deimler was a climbing mathematician who had taken up surveying for this particular trip ; Finsterwalder is a highly trained specialist.

Notwithstanding the gulf of time the expedition of 1928 is the immediate continuation of that of 1913 inasmuch as both together are the first attempt to produce a complete and satisfactory map of considerable mountain areas in the Alai-Pamirs. Side by side we see here an illustration of the great stride made in photo-surveying: and we learn that sometimes one does gain by waiting. Photo-surveying would enable a score of topographers to revise the whole of the map of the Alai-Pamirs within five years.

The expedition of 1913 was financed and entrusted to my care by the German and Austrian Alpine Association. Besides myself the official staff consisted of the late Dr. W. Deimler (topographer) and Dr. (now Professor) R. v. Klebelsberg (geologist). The latter had then already begun to specialize in glacier work. Five members came at their own expense: Dr. H. v. Ficker, now head of the Prussian Meteorological Service ; Dr. A. Kaltenbach as physician and zoologist ; Frau Kaltenbach, Mrs. Rickmers, and Herr E. Kuhlmann. The size of this personally conducted party of eight caused some misgivings in geographical circles, but I stuck to my optimism justified by former experiences. The secret is a very simple one. As Gordon MacCreagh ('White Waters and Black') so truthfully says, the leader should not march in front but alongside of his companions. Since then the three Mount Everest Expeditions have provided a brilliant demonstration of this principle.

A brain-wave made me try an unsuccessful experiment. For a scientific observer, I said to myself, walking is better than riding, and donkeys are hardier than horses. So we started out from Samarqand on foot, the baggage being carried by fifty donkeys. But these animals developed sore backs at an alarming rate. Worse still, they were stopped by the deeper fords. Bridges being rare, the rivers are usually forded, and the depth of a manageable ford is measured by the height of a horse. Hence donkey caravans only travel along certain trade-routes with shallow fords. One must remember that for more than a thousand years everything pertaining to travel, including the mentality of camp servants, has followed the horse-standard. Yet I firmly believe that a walking observer will find and note down many new things overlooked by dozens of travellers who passed that way on horseback. My ideal would be a

“handy” horse carrying collecting kit, cameras, etc., easily accessible without unloading; or, still better, a couple of porters. A “ferry-camel” for carrying valuables across the more dangerous fords would also be welcome. I have learnt something new about camels, by the way. The fine Bactrians of the Qara-Qirghiz will go almost anywhere in difficult mountain country. After a week I sold the donkeys and we took to horses generously provided by the Amir of Bukhara at the expense of his subjects.

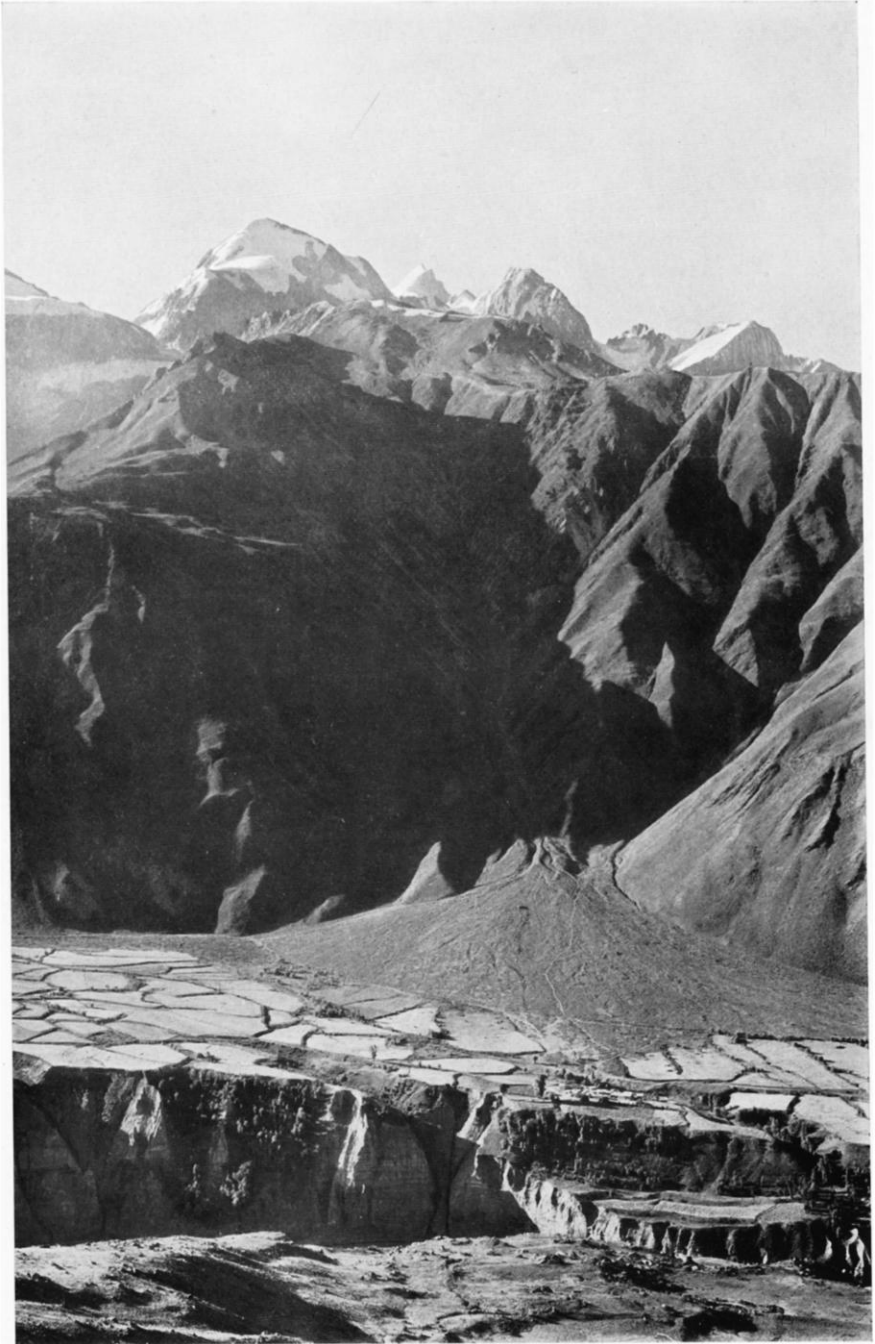
The journey lasted from 2 May to 13 December 1913, and cost £1350. From Samarqand we travelled by the Manis pass (1850 m.) across the Kemkutan mountains, a granite spur of the Hissar range, to Kitab in the valley of the Kashka Darya. Thence to Yakkabagh—Chakman Kuidi pass (2700 m.)—Tashqurghan—Langar-i-Mardan pass (3380 m.)—Sariasia—Qaratagh—Dushambe—Faizabad (1200 m.)—Ab-i-Garm (1400 m.)—Vakhsh river—Muj-i-Kharv (1300 m.)—Garm in Qarategin (1400 m.)—Kala-i-Laleh Ab (1600 m.)—Kanishbeg (1800 m.)—Tupcheq (3300 m.)—Gardan-i-Kaftar pass (3890 m.)—Langar in the Khingab valley (2200 m.)—Pashimgar (2750 m.)—Garmo glacier (to 4000 m.) and back—Aqbai Sitargi pass (4660 m.)—Sitargi on the Vanch (2340 m.)—Kala-i-Rokhar (1880 m.)—along the Panj to Kurgovad (1630 m.)—Aqbai Viskharvi (4160 m.)—Sangvar—Saghir Dasht (3000 m.)—Sariab pass (3600 m.)—Ravnau (2300 m.)—Ravnau pass into Ab-i-Nab valley—Deh-i-Baland (2000 m.)—Langar (1300 m.)—Qashbandon pass (2500 m.)—Muminabad (1200 m.)—Kuliab (600 m.)—Island of Urta Tugai in the Amu Darya—Qurghan Töbe—Kabadian—Baba Tagh—Yangi Bazar in the Surkhan valley—Mirshadi—Baisun—Gusar—Karshi—Bukhara.

Ficker and Klebelsberg took another route home: Khingab—Tabidara (1730 m.)—Talbar pass (2700 m.)—Khovaling (1490 m.)—Baljuan (970 m.)—Faizabad (1200 m.)—Dushambe (930 m.)—Kala in the Varzab valley (1100 m.)—Sigdi (2010 m.)—Shutur Gardan pass across the Hissar range (3555 m.)—Takfan (1820 m.)—Laudan pass (3675 m.)—Kshut (1400 m.)—Panjkent—Samarqand. To this itinerary must be added a great number of side excursions, glacier explorations and mountain climbs. We ascended about thirty peaks, the highest being 5700 m. As we climbed for topographical and geological purposes only, we had no time to waste on the highest and most difficult mountains.

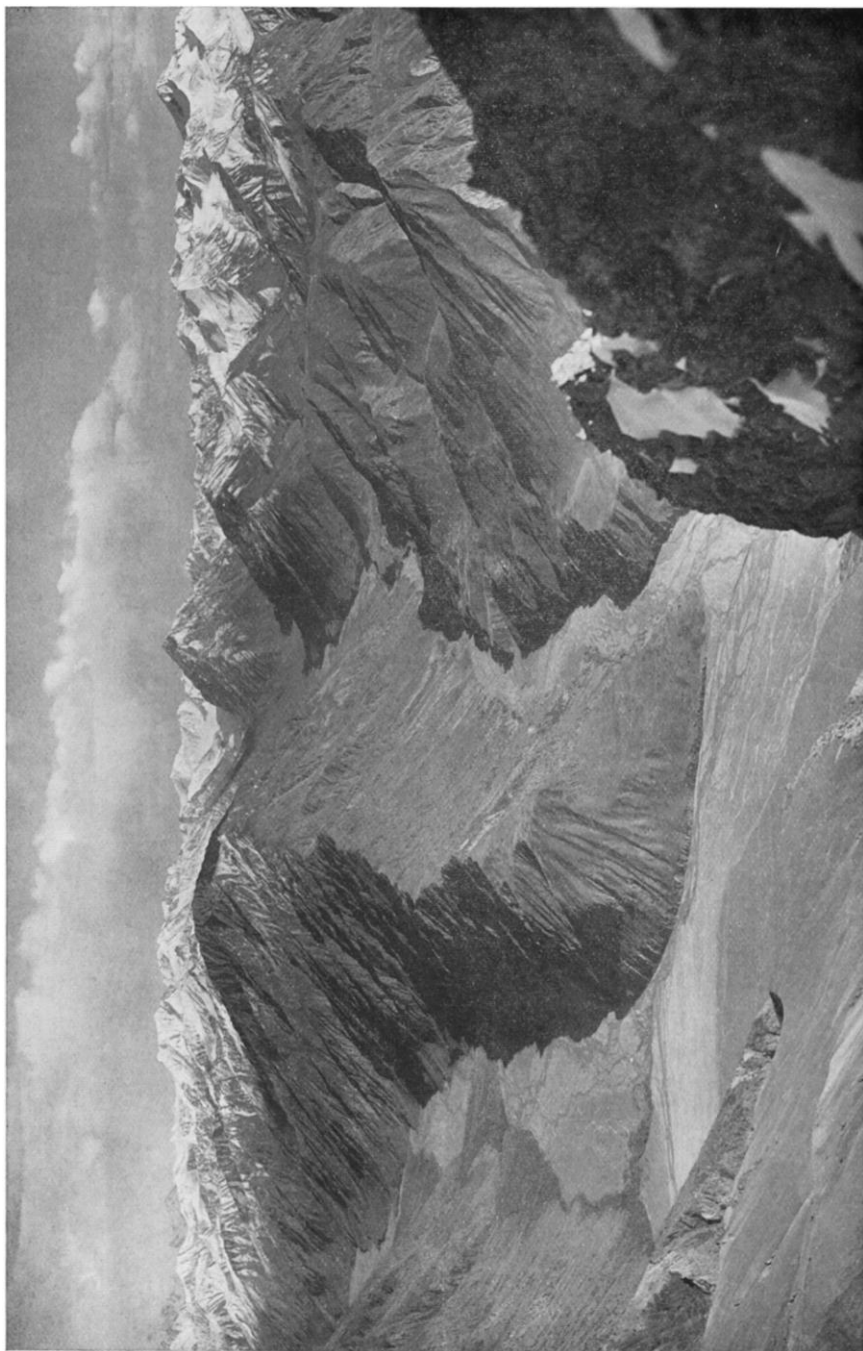
I shall now briefly refer to the main results and various points of interest. Of Deimler’s maps I have already spoken. Klebelsberg wrote ‘Beitrage zur Geologie Westturkestans’ (Innsbruck, 1922, 480 pp.). The Vienna Academy of Science published Ficker’s ‘Untersuchungen über die Meteorologischen Verhältnisse der Pamirgebiete’ (Wien, 1919).

Klebelsberg’s most brilliant discovery is perhaps that of the great Vakhsh fault marked by hot springs (Ab-i-Garm, 40° C.) and frequent earthquakes (destruction of Qaratagh in 1907). From the writings of Mushketov and others it is possible to pick up the continuation of this fault along the Alai valley and the Kashgarian Qizil Su. Extending from the Hissar province to the Tarim basin the Vakhsh fault coincides with the valleys marking the orographical boundary-line between the mountain systems of the Alai and the Pamirs.

Upper Qarategin presents a number of old land surfaces, notably that of



Mountains on left bank of Khingab above Kala-i-Lodzhirk



Looking into Garmo and Bokhud valleys, Dardaz

Tupcheq (Qara Shura), which is at the same time associated with moraines of various ages. The grandest of the old surfaces is that of Darvaz (Saghir Dasht and surroundings).

The snow-line rises from about 4000 m. in Qarategin to about 5000 m. in the Garmo valley, following as usual the elevation of the central mountain mass. To this may be added the increasing distance from the western sources of precipitation. The difference between the north and south faces is enormous, amounting to not less than 1000 m. In September I climbed Mirza Tash (5300 m.) on dry rock from the south. On the top a parapet of snow 4 feet high proved to be the upper edge of a precipitous ice-slope falling away thousands of feet to the Gando glacier on the north side.

It is as yet too early for linking the stages of glaciation with those of the Alps. One of the farthest advances is marked by the fine landscape of terminal moraines left by the old Muk Su glacier (Fedchenko glacier) at the junction of the Muk Su with the Qizil Su. Witnesses to the most recent retreat are the dirty and rubbish-laden lower reaches of dead ice often extending upwards for miles before the white or live glacier is reached. These black snouts seem to point to some comparatively sudden change in which the shortness of the glaciers may have acted as a contributory cause. The longest glacier of the range of Peter the Great does not exceed 12 miles. Many considerable ice-streams such as the Barolmas have neither upper snow basins nor lateral feeders, but depend for their subsistence entirely upon ice-avalanches from the steep walls of corries at their head. Altogether the Alai-Pamirs form a glaciological laboratory which owing to its accessibility facilitates and, owing to climatic contrasts, deserves continuous systematic observation. As an island surrounded by deserts this mountain region forms a splendid object of comparison with the Alps. Here one can apply to new surroundings the knowledge acquired in the Alps during more than a century. On the other hand Turkistan, owing to the dryness of the climate, and the lucidity of the processes of denudation or accumulation, may throw fresh light on the history of Alpine glaciation.

I cherish the fond belief that the solution of the riddle of the dead cities of Chinese Turkistan is to be sought among the Pamir glaciers. Nothing seems to warrant the assumption that the Tarim basin was a zone of rainfall cultivation in historical times. If the change of climate responsible for glacial periods also produced more rain in Central Asia, then it must have been before the advent of historic man, or, to be exact, before the immigration of peasants. The dead cities lived on agriculture by irrigation which drew its water from rivers partly fed by residual ice, by dead ice not replenished from precipitation above the snow-line. This store of ice left over after the last glacial retreat, or cessation of surplus feeding, gradually dwindled. The rivers decreased in volume and after a time were unable to fill the irrigation canals of outlying districts. In that case the problem of the (historic) desiccation of Inner Asia would be changed from one of rainfall to one of residual melting. Thus we should be able to detach this narrower problem from the wider one of climatic change, which looms beyond. We are at once struck by the fact that the stoppage of supplies from the atmosphere must have been more rapid than the melting of old stores. This would point to a comparatively

sudden change of climate. But then everything is or appears sudden in Central Asia. It is a country where every difference is magnified into glaring contrast. The dead glaciers of to-day furnish an example on a smaller scale, although here earthquakes may often be a cause of irregular feeding by shaking the heavy breast-plates of ice from the towering precipices of the upper corries.

From Tashqurghan at the foot of the Sang Gardak mountains Mirza Akhram, the secretary of the Beg of Yakkabagh, led us to the cave Kala-i-Shiran in the limestone canyon of the Kala Sai torrent. The floor of the picturesque gorge is covered with thick jungle where hoary junipers mingle with the slender birch. From a round hole high up in the red-encrusted cliff bursts a powerful jet of water. The two porticoes of the cave open out on the right bank at a height of about 2400 m. above sea-level. The familiarity of our guides with the locality, the remains of torches, and broken stalactites showed that the place is used for pilgrimages or tamashas. Legend calls it Tamerlane's horse-stable, which seems justified by the thick layer of droppings, although these come from the less romantic sheep. Digging a hole we came upon layers of broken bones, and in a cranny we found a very old clay lamp. One of the caverns—its continuation runs into the main cave after a short distance—is neatly walled up with alternate layers of blocks and wooden beams ("gallic" wall). Earth filled in behind makes a wide platform. We went in about 500 yards through halls alternating with narrow passages. In one of these worm-holes I had to crawl flat on my belly. It makes one feel buried alive. The fat Aksakal of Tashqurghan stuck and had to be pulled out by his feet. I refrained from excavations on a large scale for fear of spoiling the work of future experts. Kala-i-Shiran certainly promises well, for its human record must stretch unbroken far into the dim past, although it remains doubtful whether neolithic man ever roamed in this neighbourhood. But cave animals there may have been.

Another little-known place I visited was the island of Urta Tugai formed by two arms of the Oxus south of Kuliab. It was a wonderful paradise of jungle, reed swamps, water runnels, steppe, and sandy stretches, swarming with pheasants, wild pigs, stags (Bukhara type), and tigers. Here I should have liked to roam in the crisp October air, but the unconcealed impatience and contempt of the mathematician drove me from the land of happy play after I had slain only a big tusker. At Kokul just beyond the lower end of Urta Tugai there was a permanent ferry to the Afghan bank.

The climate of the Alai-Pamirs is on the whole as simple as it is dry, though complicated by local vagaries which still require close investigation. The traveller delights in long spells of fine and steadfast weather which does away with much uncertainty in the planning of mountain excursions. To make up for this, visibility is often impaired or entirely suppressed by yellow dust-fogs due to loess carried upwards by currents of hot air. The finer the weather the thicker the mist.

To the temptations of nomenclature we only yielded within forgivable limits. Explorers being poor men, or young men, or both, how can they show their gratitude to helpers of the financial or professorial world better than by writing their names on the map? Our most pressing want seemed to be a

uniform designation of the whole of the range from Mount Sandal (Altin Mazar) to the mouth of the Khingab. Peter the Great already being represented by the western half, we considered the imperial house of Romanov appropriate to the whole. The eastern portion is sometimes called Periokh Tau on older maps, being a corruption of Pir Yakh Tau (peak-snow-mountain, or range of the snowy peaks). Since then the wheel of history has caused the demands of topography to be supplied from other sources, but here as in Canada the bad habit has apparently come to stay—I mean the habit of turning mountains into monoliths in memory of the living.

Is it then so difficult to invent names with local colour? Nobody ever suspects nowadays that Mirza Tash, the "Stone of the Scribe," was invented by me in honour of the official who accompanied me as representative of the Amir. Scholars versed in Persian or Turki or the old Indian dialects of Canada should be able to turn out pithy or poetical names by the hundred.

Our easternmost point was 10 miles up the Garmo glacier, where Dr. Deimler and I were turned back by bad weather late in September; bad weather always means difficulties with porters. From the top of Mirza Tash, which rises above the right bank of the glacier, I obtained a wonderful view of the central Sel Tau and its western branches. Here, then, was my dream-land of the future. And this future more than justified its name, for it lasted fifteen years.

When from a large party in 1913 I blossomed forth into a still larger one in 1928 the step was accepted almost as a matter of course. The era of collective travel by land had established itself in the natural course of events, and the Mount Everest expeditions had restored public confidence shaken by earlier failures.

Consisting of eleven Germans and eleven Russians, the Alai Expedition of 1928 was not only a very large one, but also characterized by the close collaboration of two peoples. This latter feature also has come to stay. Nations on whose territory there is something to investigate no longer care to appear as the passive object of foreign scientists. To begin with, it might be thought that they were incapable of describing their own country. Furthermore, they do not see why their antiquities or ethnographical rarities should be the booty of museums abroad. And finally, a tradition lingering in the popular mind places every explorer into a country peopled by savages. Nobody wishes to exclude helpful neighbours, but everywhere self-esteem has begun to formulate this condition: There shall be no foreign exploration by others without our own active share as homeland explorers.

On sea voyages big scientific staffs have long been customary, for the ship at once suggests a floating university. But on land a geographical levy in mass was rarely attempted with success. Yet one may well ask why Jenghiz Khan and Alexander the Great were able to push vast armies into Europe and India. It seems however that military undertakings belong to another plane of comparison, nothing being easier than to raise money for war, whereas the ventures of trade or science are usually dependent upon private enterprise. Generals have unlimited means and unlimited powers. Military discipline cannot be enforced in exploration because a really capable specialist

will always be an independent thinker and worker. It is therefore easier to manage five thousand soldiers than five scholars.

On the vast expanse of desert or steppe the motor car enables us to mimic sea traffic on land. One feels tempted to elaborate the obvious analogy between a fleet of desert-cars and a fleet of polar vessels.

Apart from these considerations the modern exploring party shows the inevitable evolution from the journey of discovery to the journey of study or committee of investigation. The preliminary survey of the field is followed by an inventory of every detail. Discoverers hunt better alone or in couples, their wide spaces calling for a corresponding liberty of movement. Whatever he may have been besides, say a geologist or botanist, the older traveller had always to be a route-surveyor. His foremost duty was the map, for without a map his work in other directions, however good, remained unscientific in the geographical sense. Geography is the science of map-making and of coordinating all knowledge with the map. In those times it was enough to be a topographer, for mountains, forests, man, and animals were so new that one had only to look at them with open eyes and describe them with a vivid pen.

To-day the world is discovered, that is to say known everywhere in outline. Bold sketching no longer helps; the mosaic between the contours has to be filled in. The finder is being replaced by the examiner, the prospector by the sinker of shafts, the eye by the instrument, the story-teller by the measurer and statistician. The Earth is shrinking, and peoples begin to discover each other instead of waiting for that ridiculous man from Berlin, London, or Harvard. And of the more primitive tribes there are hardly any left who do not expect to be explored at more or less regular intervals, while a few hidden away in dark corners take it for granted that they will soon be discovered.

All human activity moves from extensive to intensive cultivation or organization. The nomad becomes a peasant, the peasant a gardener. But as movement cannot be dissociated from life, nor travelling from exploration, the new order of things has been brought about by a division of labour. Geographical exploration is split up into pure travel and pure study. The leader becomes a travel specialist with an understanding of the needs of each science. At home he builds up an institute. This he lifts bodily through space, setting it down in the distant playground. His companions do not travel there, but are transported. They are let loose on the plot to be cultivated, each starting on his own career of adventure and discovery. Yet all remain united by a central organization, for it is the duty of the leader to relieve his scientific collaborators of the routine of travel. Not theirs to ask how to move, what to eat, or where to sleep. Horse, food, and bed await them at the appointed place and time.

As in all big modern factories, so here, greater capital expenditure must be compensated by quicker results within a given time. The old explorer often stayed away for years; a year may be taken as the minimum. The Russo-German Alai Expedition lasted six and a half months, only five of which were devoted to actual work on the spot. In spite of this the scientific results will fill the usual volume of a thousand pages.

And now one will understand why I have nothing sensational to report.

There simply had to be no adventures if our task was to be done thoroughly and in time. Formerly discoverers went out in search of adventure, for they opened up new ways across oceans and continents, and an unknown road always means adventure. Now adventure has been driven from the high-roads to the lanes and by-paths. For the modern leader any adventure worth talking about means an engineering accident or a flaw in the organization. If thus he foregoes the full measure of popularity which is the reward of mighty deeds, he should remember that it was the heroism of his countless predecessors which made a science of travel possible.

A sympathetic public will have to change its mental attitude towards explorers, if in future it wishes to do them justice, for the adventure of accidents is gradually being transformed into the adventure of organization, almost of high finance. Instead of the sensational fight with unexpected obstacles there is the noiseless war with detail, with equipment, tactics, and accounts. Only the final result of the undertaking becomes visible. For ever invisible remain the sensations surging in the breast of the leader.

The sponsors of the Alai Expedition (1928) were the *Notgemeinschaft der Deutschen Wissenschaft* in Berlin and the U.S.S.R. Academy of Sciences in Leningrad. The costs were shared by the Soviet and German sides. Elsewhere I have enumerated the long list of those to whom thanks are due. Let me here concentrate my gratitude upon our chief representatives, upon His Excellency Dr. Schmidt-Ott, President of the German Society in Aid of Science, and our Russian leader, Nikolai Petrovich Gorbunov, Chief of the Executive of the Soviet of Peoples' Commissaries. As the third participant in the honours and expenses I must mention the German and Austrian Alpine Association, which contributed four excellent mountaineers. This is not the place for a complete list of our staff and their functions. I shall mention names as occasion offers. During August climbing visitors from Moscow brought our party up to thirty. There never was any grouching or sulking to interfere with work, but only the usual relief of overpressure through the safety-valve of a few well-chosen words. And Russian hospitality was as wonderful as ever. I do not mean sumptuous dinners—those days are past—but the eager interest taken in visitors, and the wish to be helpful.

The official name of the expedition is now the Alai-Pamir Expedition. During its inception it had however been decided to camouflage it as the Alai Expedition. Its main objective, the Sel Tau, was ruled out as being too little known. We did not like to mention the Pamirs, fearing to arouse suspicion, for the Pamirs are like three mighty hands clasped in a grip of steel, each holding on for dear life, yet each hoping that the others might let go. Now that all is over, one realizes that the schemers of dark plots would not have taken a dozen foreigners into their confidence, least of all map-makers. All the same the governor of Kashgar concentrated troops on the border, and many Qirghiz fled into Chinese territory when they heard of our coming.

Early in 1927 I was ordered to start on the somewhat appalling task of getting the equipment ready. How this is done can best be gathered from the three Mount Everest volumes, so that I need not repeat history. But I may

be permitted to dwell upon a hobby of mine which is The Permanent Equipment Shop, "shop" here to be taken in the sense of modelshop and workshop. The science of equipment lacks centralization, so that each traveller or expedition is forced to build up a new organization. It is easy enough to assemble the theory from books, catalogues, and experts, but one misses the rooms where the tradition of tangible things is continued unbroken. To begin with, it is difficult to rent comfortable and business-like quarters for so short a time. I have vivid recollections of odd corners in draughty warehouses, of basements kindly lent, and other localities which one must often be ready to leave at a moment's notice.

What I want is a spacious well-lighted hall which can be made reasonably warm in cold weather. On the floor are painted the ground plans of various tents, boats, wagons, trucks, and cabins, their sections being repeated on the walls. There is a stuffed horse, a camel, a sheep, a porter for trying on loads. Scales big and small will not be forgotten, nor a shaking machine for testing packs. There are work benches and tools of every description for the amateur mechanic, together with an ever-increasing collection of materials (wood, metal, paper, glass, celluloid, textiles, etc.) in their various shapes (flat, long, hollow, etc.). It is most important that one should be able to see, handle, and compare all the possible stuffs from which a thing can be made. There is a representative collection of articles of outfit, models, and dummies, especially receptacles, boxes, and bottles. Next door is the shed for packing and storing. The garden offers space for experimental camping, as well as for playing with fire, mild explosives, pungent chemicals or big noises. All this is in permanent charge of a handy man, a many-sided amateur mechanic. An office contains every facility for correspondence, drawing, and filing. There is a library, while card-indexes furnish classified information on every possible subject connected with equipment: sizes, measurements, carrying capacities, the physical properties of materials (waterproof, insulating, absorbent, soft, elastic, etc.). An Honorary Equipment Secretary surveys the whole. Here at last the art of equipping is brought into line with the scientific management of a modern navy yard or brewery. One can afford a high fee for the use of these rooms, say 10 per cent. of the sum ear-marked for outfit. Why, one would save three times as much in the shape of money otherwise wasted on ballast or useless transport.

There is always the choice between the extremes of a large luxurious outfit and a small Spartan kit. The former is easier to buy, but causes endless trouble and disgust unless one has a special store-keeper (in this case myself). The frugal furnishings require very much more thought at home, but make for a care-free life on the road. There are no lists to keep, as nearly every article is in daily use. When a traveller feels overburdened, there is only one remedy, namely jettison. I was able to save my surplus stores owing to a permanent caravan hired for five months. This was rendered necessary by the constant shifting of base-camps and the frequent redistribution of our skirmishing groups. When we were not actually marching the horses went to and fro between dumps.

The modern travelling scientific institute has to be provided for regardless of weight, for to ensure success within a given time there must never be the

shortest delay due to the temporary want of food, spare parts, or refills. As in scientific industrial management, the proportion between time and work done is a question of money. Other conditions being equal the quick but more expensive management of bulk comes cheaper in the end than piecemeal haulage. The Alai Expedition with its 30 Europeans, 40 servants, 180 horses, and 70 camels accomplished within six months what would have been the task of many years for smaller units. It meant, of course, that the leader had to do all the housekeeping of the expedition, and nothing else. Even then I might have found my hands too full had not Professor Shcherbakov taken many a burden upon himself.

Two large boxes of medical stores have been left at Tashkent for future use, for we had only three surgical accidents and no sickness worth speaking of. As I started my companions on quinine in Leningrad, we had not a single case of malaria. The drawing of teeth was a relaxation which I reserved for my own moments of leisure.

As regards presents one should distinguish between friendly free gifts and presents instead of money. Worldwide trade has by now educated the savage of the story-books who gave food or valuable things in return for rusty pocket-knives or cheap trinkets. Asia with its ancient trade-routes is the last place for speculating in presents. The simplest and in the end cheapest plan is to pay with money or with the standard trade goods, which are but another form of currency. I carried two horse-loads of silver equal to ten camels in the guise of universal providers. Special services or liberal hospitality were rewarded by excellent tools, razors, scissors, hunting knives all of stainless steel, field-glasses, and good jewellery.

In 1928 I wanted to continue where I had left off in 1913. To begin with, I must find out what had been done in the meantime. Fortunately the core of my "reservation"—the central Sel Tau—remained untouched, although the great wave of Russian exploration had thrown a few ripples into the outer bights. In 1917 Byelyaev visited the Garmo glacier and used up the wood which I had dumped on the ice. This pile consisted of trees gathered from a dead forest of juniper lower down on the right bank (change of local climate owing to advance of glacier?). I had hoped that in later years these logs would enable me to estimate the rate of glacier movement. Korjenevski continued his exploration of the Muk Su and also penetrated to the snout of the lowest glacier in the Tanimas valley. Right glad was I to see that Sir Aurel Stein had skirted my ground in 1915—a close shave for me indeed (*G.Ž.*, 48, 3, 211 ff.). His article forms an excellent introduction to my report. By referring the reader to his descriptions and photographs I save myself much repetition. Arved Schultz's new book (*'Landeskundliche Forschungen im Pamir,'* Hamburg, 1916) provided me with an up-to-date compendium.

I have brought home a big trunk full of recent Russian literature on Turkistan. The government has taken up exploration as a national matter to be financed by the state. The Academy has a standing committee for organizing expeditions. Last year they sent out between one hundred and two hundred expeditions (I forget the exact number). Most of them are of course small, numbering only one, two, or three men. With funds that to us appear

ridiculously inadequate they face the sands of Qara Qum and the icy swamps of Siberia. I admire these Russian travellers in comparison with whom we are lamentable sybarites.

The main task was a map of as large an area of the Sel Tau as possible (Finsterwalder, Byelyaev, Dorofeev, Issakov, Biersack) overlaid by geological (Nöth) and meteorological (Zimmermann) observations. Around this solid centre was to be grouped the work of the linguist (Lentz), zoologists (Reichardt, Sokolov, Reinig), botanist (Gorbunov), and many other specialists in highly technical branches (geomagnetism, radiology, etc.). Professor Korjenevsky, to our great regret, had to turn back in the Alai valley owing to a weak heart. The well-known company Mejrabpomruss was represented by Messrs. Shneiderov and Tolchan, who produced a very fine film. Herr Wien took charge of the radio for time-signals.

The craving for a few special plums of adventurous discovery was to be satisfied by the crossing of mysterious passes and the ascent of the highest peak. The biggest discovery however, that of the inordinate length of the Fedchenko glacier, came as a complete surprise. The leader, the topographers, and the geologist were necessarily mountaineers. They were supported by a force of crack climbers (Borchers, Allwein, Wien, Kohlhaupt, Schneider) for reconnoitring.

On the Russian 10-verst map (1 : 420,000) the curiosity of the traveller is attracted by the words "Foot Pass" or "Former Pass" written across the crests of several high ranges. Upon inquiry the natives always answer, "O, Tura, our great-grandfathers have used this pass, but it has long ago become impassable owing to the ice." An increase of ice (covering easy slopes) or a retreat of the glacier (exposing steep rocks) is variously given as an explanation. In 1913, however, Professor von Ficker succeeded in finding and crossing one of these mysterious highways, the Sagram, which connects the head of a left tributary of the Muk Su with the Sagram river. At the village of Pashingar the Sagram flows into the Garmo torrent, which from this point onward is known as the Khingab. Ficker had to feel his way towards the pass as none of the Muk Su Tajiks were willing to give information. Only when he had reached the low saddle separating two easy glaciers did his porters reluctantly admit that this was a well-known and much-used pass. To men on foot it offers no difficulties whatever, and one might at a pinch be able to get horses across. The secrecy surrounding such an easy pass showing traces of constant use can only be explained by the wish of the Tajiks (Galchas) to hide it from the Qirghiz, so that it can always be used for flight or for fetching reinforcements.

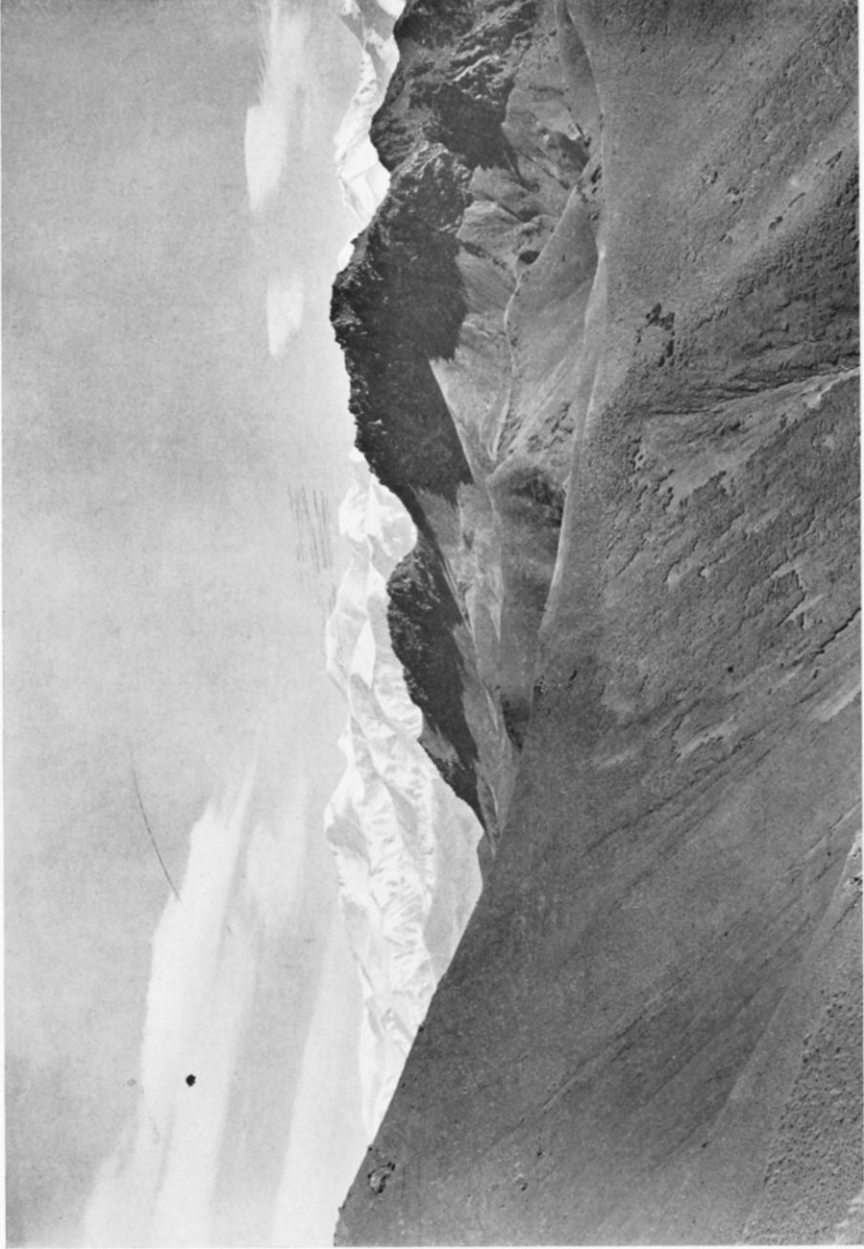
The old Aryan population of Darvaz sits astride the boundary ranges so that on the northern slopes of the mountains of Peter the Great (Qarategin) and on the eastern slopes of the Sel Tau (Pamirs) the Tajik are dovetailed into the Qirghiz. This zone of contact means a state of silent war between the two races, each trying to extend its pastures or fields. It is not a war between two nations as a whole, but a state of economic pressure giving rise to small local adjustments where families grow or dwindle. Here and there one finds groups of stone hovels representing relinquished outposts of the Galchas



Snout of Sildi glacier, Tupcheq



Kala-i-Shiran cave



Looking towards Mount Kaufmann from Tengiz Bai Pass

driven back by the Qirghiz. It is not so easy to see where the nomads have retreated as they leave no permanent buildings behind. Real battles on a large scale do not seem to take place, at least not since the Russian conquest of Turkistan. Curiously enough the two even mix quite readily in some localities. They share the wide pastures of Tupcheq, while in Qarategin on the banks of the Surkhab we find villages where Tajik and Qirghiz till the soil in perfect harmony. Here the nomads prove that they are perfectly capable of settling on the land. The Qirghiz of Qarategin are excellent agriculturists. They are far more intelligent and progressive than the Tajiks. At the University of Tashkent they enjoy the reputation of being good mathematicians.

If the Sagraan was merely kept secret, the higher passes across the central Sel Tau, notably the Kashal Ayak, were really abandoned long ago. Being fairly easy for hardy mountaineers, although very long and strenuous, they have not been closed by the forces of nature, but have become obsolete for historical reasons. When the Russians came into the country they did away with small boundaries, welding tribes and minor states into one whole of law and order. Short cuts or loopholes for fugitives, spies, and smugglers became unnecessary. I believe, however, that the Tajiks still use them in a small way and that their memory, notably that of the Kashal Ayak, is kept bright for future emergencies. Dr. Kohlhaupt found the droppings of horses near the second glacier of the Tanimas. We picked up an old corn-pestle below the Notgemeinschaft glacier, and near Dust Camp discovered a hunters' lair with a wind-screen, cinders, and ibex horns. All this would show that the upper Tanimas valley has never been quite deserted. Besides hunters and shepherds, prospectors for gold must be counted among its regular visitors. Indeed, our very presence may have been responsible for its look of utter desolation, a sort of camouflage by abstention.

In this connection I may mention that the route Pamirs—Zulum Art pass—Baland Kiik valley—Kaindi pass—Altin Mazar—Daraut Qurghan is still being used by smugglers from Chinese Turkistan. The frontier guards who accompanied us made a big haul of over a hundred sheep that were being driven down the Baland Kiik from Kashgar. The Russians do not seem to keep a very strict watch on the Pamir boundary, but to rely upon catching the contraband nearer its point of destination. The smugglers on the other hand must have great confidence in the secret sympathy of the population. This route may well have been an alternative to the old trade route from Eastern to Western Turkistan, for one can take camels along during the autumn months. But as it is bound to join the main road at Daraut Qurghan, there being absolutely no other way out from Altin Mazar, this alternative can only have been of use to avoid dangers lurking in the Alai valley between the Chinese frontier and Daraut Qurghan.

In my plans for an attack upon the central Sel Tau I had to consider two approaches, from the west and from the east. In this choice I was guided by the size of the party, by the wish to start work as early as possible in the season, and by the advantages of one central base-camp for all operations. The roads through the steep and narrow western valleys are more difficult for large caravans than the flat Pamirs. On this side which faces the sources

of precipitation the wet spring weather lasts longer than on the Pamirs, which are practically rainless. A glance at the map, furthermore, shows three big valleys descending from the western flanks of the Sel Tau range, namely the valleys of the Khingab, the Vanch, and the Yazgulam, whose high dividing ridges mean difficult lateral communications along the great mountain chain. Towards the Pamirs there is only one big valley, that of the Tanimas or upper Bartang. Now when one valley does the work of three opposite ones one may surmise that its branches join the heads of the three counterparts, thus giving access to the same length of main range. Hence one base-camp would do for three. This strategical theory proved itself correct although in quite an unexpected manner. In reality it is not the Tanimas river but the Fedchenko glacier which, as a drainage system, corresponds to the western valleys. We hoped to discover an enormous Tanimas glacier, instead of which we found a dry valley which only serves as an overflow to the Fedchenko during high glacial tides.

The only difficulty on the eastern side, and that a serious one, is the question of supplies. Apart from the Alai valley, where numerous rich Qirghiz pasture their flocks, our way from Osh to the base-camp was practically through uninhabited desert. Late in June the few inhabitants of the Alai mountains north of the Taldik pass had already left for the higher ground. From Bordoba to Tanimas past the Great Qara Köl and Kokjar we did not see more than about a dozen yurts or families. This also meant scarcity of fodder and fuel, for the number of Qirghiz is on the whole proportionate to the grazing surface. And scarcity of cattle means scarcity of dung for the kitchen fire. Teresken (wormwood), the only other fuel, is nowhere plentiful along the usual tracks or around the camping-grounds. Hence when one has a large caravan, decency forbids camping longer than one night on the green spots barely sufficient for the flocks of the nomads. In between these places our horses found next to nothing to supplement their barley rations. These conditions forced us to accumulate a big dump of flour, barley, and wood (archa, *i.e.* juniper) at the ruined rabat (rest-house) of Tukur Bai on the eastern shore of the Great Qara Köl. These stores were brought thither by camel caravan from Osh, the wood being picked up in the juniper forests of Oltin Lug on the north side of the Taldik pass. Here we also concentrated close upon three hundred sheep, most of which came from the Alichur Pamir, where they were more numerous and much cheaper. After the establishment of the base-camp our horses were kept busy fetching supplies from Tukur Bai.

To this must be added the difficulty of obtaining porters for transport on the higher mountains and glaciers. We drafted these men from the upper villages on the Bartang, 30 and 40 miles away. The distance made recruiting still more difficult, as it had to be done through emissaries. Moreover, these Tajiks (mountain Tajiks or Galchas) are a very unenterprising race, and during summer their minds are wholly occupied with their wretched barley crops. One cannot even tempt them by an offer to buy their poor harvest outright.

All this made the base-camp in the Tanimas valley very expensive. But it was then the only possible take-off for a frontal attack upon the long line of the Sel Tau. The head of the Khingab valley would have been far more agreeable. There one lives in the midst of a large population, while supplies



Looking from Dust Camp to narrows formed by dead ice snout of Notgemeinschaft glacier



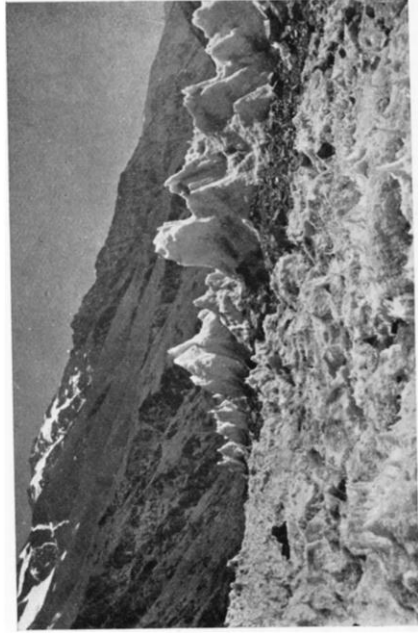
Glacier II, Tanimas: alluvial cone from side gully blocking main valley



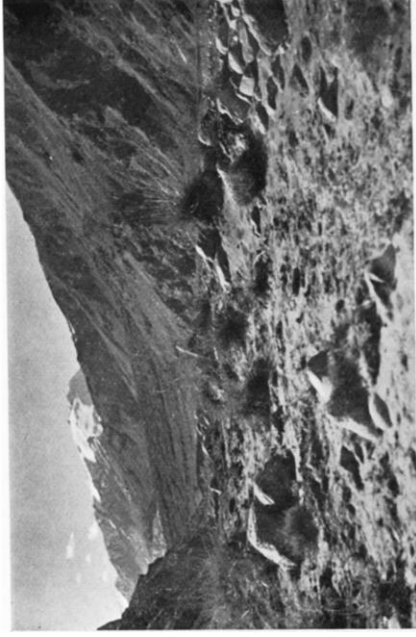
Terraced shelf, Kaniadi valley



Glaciers on south side of Tanimas valley below pass



Pinnacles on Glacier III, Tanimas



Sand-dunes in Tanimas valley above Notgemeinschaft glacier

can easily be obtained from Qarategin. Beautiful jungle grows right up to the snout of the Garmo glacier. But after that one lands in a cul-de-sac. To-day we know that the best base is Altin Mazar, whence the Fedchenko glacier forms a high-road from north to south. But then, who could have dreamt that the best base for exploring a long range was at its very end? Altin Mazar is only five days from Marghilan by easy roads, whereas it takes at least a fortnight from Osh to Tanimas across the Pamirs.

Not wishing to repeat myself, I must refer the reader to the preliminary report of the German Society in Aid of Science (Deutsche Forschung, 'Aus der Arbeit der Notgemeinschaft der Deutschen Wissenschaft,' Heft 8, "Die Alai-Pamir Expedition 1928," Berlin, 1929, 196 pp.). Here I shall only give a compressed itinerary and a mere abstract of results.

Main Line

Osh (left June 19)—Gulcha—Qizil Qurghan—Sufi Qurghan—Qizil Beles pass—Taldik pass—Saritash—Bordoba—Qizil Art pass—Kok Sai (Markan Su)—Tukur Bai (4000 m., July 2 to 8)—Ju Ui (Muz Qol river)—Lake Quruq Köl—Qirghiz camp Qara Chim (about 4200 m.) below Qizil Beles (about 4400 m.)—Kokjar—Urus Tugai (Sea Buckthorn Camp) on the lower Tanimas (3200 m.)—Dust Camp above snout of Notgemeinschaft glacier (3500 m.)—Tanimas pass (4400 m.)—back to Kokjar (September 10)—Takhta Qorum pass—Kaindi pass—Altin Mazar—Ters Agar pass—Daraut Qurghan—Tengiz Bai pass (3400 m.)—Qaraul (1100 m.)—Uch Qurghan Aravan—Osh (October 21).

Branch Lines

From the Great Qara Köl to a camp in the Qara Jilga valley and thence exploration of the glaciers on the south side of the Trans-Alai, partly with the object of finding a way up Pik Kaufmann (renamed by the Russians Pik Lenin).

From Dust Camp to nearly all the glaciers of the central Sel Tau. Ascent of many peaks. Then down the Fedchenko glacier to Altin Mazar.

Across the Kashal Ayak pass and back (Borchers and Wien). Long stay at Oroshor on the upper Bartang for ethnographical purposes (Dr. Lentz). Lentz and Kohlhaupt afterwards travelled to Qarategin across Darvaz and the Gardan-i-Kaftar pass. Lentz finally went home by way of Dushambe.

Daraut Qurghan—Katta Qaramuk—Achik Alma—Jailgan in the morainic landscape between Muk Su and Qizil Su. Ascents in the unexplored mountains between the two rivers. Back to Daraut Qurghan.

Great Qara Köl—Aq Baital—Shor Köl—Rang Köl—Aqsu—Pamirski Post—Yaman Tal—Naiza Tash—Alichur Pamir—Kumdi pass—Zor Köl—Pamir Darya—Madz pass—Shakh Dara—Turumtai Köl—Koitesek pass—Bulun Köl—Yashil Köl—Langar Davan pass—Sarez Köl (landslide lake)—Nusur on the Bartang—Kokjar (September 12). This is the route of our zoologist Dr. Reinig.

Bartang—Khorjin pass—Yazgulam pass—Fedchenko glacier (Gorbunov and party).

Rang Köl (Gorbunov and party).

Dr. Nöth, our geologist, traversed the ground in all directions. Professor Korjenevski explored glaciers on the north side of the Trans-Alai near

Bordoba (Burtope Mazar). Allwein, Wien, and Schneider ascended Pik Lenin (7130 m.) on September 25. This summary of itineraries does not claim completeness in every detail, but will be enough to give an idea of the work done.

Dr. Finsterwalder, assisted by Herr Biersack and T. G. Dorofeev, photographed from 130 standpoints, measured various base-lines, and made a series of triangulations. A number of astronomical points were determined by Professor Byelyaev of Pulkovo, who also helped with the triangulations and other exact measurements. Finsterwalder brought home 600 half-plate negatives, all of which came out well. From his material he promises us the following maps: A stereoautographic map 1 : 50,000 covering 400 square miles of the Fedchenko and Tanimas glacier systems, almost without a single gap. Then a "ridge" map showing 6000 square miles of the Sel Tau, Trans-Alai, and Western Pamirs. In this the amount of detail will vary considerably. A few special maps, such as that of the lower Notgemeinschaft glacier, will supply glaciological data and enable us to judge future changes. A set of repeated photographs from the same standpoint makes it possible to compute the present rate of movement of some of the glaciers.

Dr. Nöth thinks that the folding up of the Alai-Pamirs began at the end of the Palaeozoic epoch, probably between the Carboniferous and Permian periods. Then all the ranges rose simultaneously. During the Jurassic period the region was partly covered by sea, with the exception of the northern portion which was probably lifted. This conclusion is derived from the continental character of the Jurassic sediments of the Trans-Alai. The Cretaceous sea encroached still farther, so that the Alai channel probably connected the Cretaceous basin of Bukhara with that of Tibet. The sediments of the inner Pamirs however retain their continental character. During the early Tertiary period we may assume the first upheavals along the Alai synclinal, judging from the enormous conglomerates of early Tertiary origin. In mid-Tertiary times mountain uplift was at its height. There was folding of the Mesozoic and early Tertiary strata of the Alai valley and an over-thrust of the Pamirian chains. The sea finally withdrew, leaving the region to the processes of denudation and accumulation. Dr. Nöth furthermore emphasizes the fact that the general strike of the folds runs east-west. A north-south strike is nowhere continued for long. Hence north-south ranges such as the Sel Tau are not tectonic ranges. Along the western flank of the Sel Tau runs a considerable fault which forces the glaciers to descend in gigantic ice-falls 1000 feet and more in height. Round the Great Qara Köl there is remarkable good evidence of three tiers of old land surfaces at about 4100, 4250, and 4450 metres above sea-level. All the glaciers are in retreat with the exception of a small tributary of the Tanimas.

The results of my Russian collaborators are not yet to hand. N. P. Gorbunov specialized in economic botany, and also attempted the artificial fertilization of ewes of the fat-tailed sheep from freshly killed rams of the Pamir sheep (*Ovis poli*). Dr. Zimmermann's meteorological observations should throw much light upon the climate of the Pamirs. After setting up observatories at Saritash and Tukur Bai, which were run by his assistants for three months, he accompanied us to Dust Camp and the Tanimas pass. The study of this weather-divide is important for glaciology. Messrs. Tabulski and Brimann

conducted radiotechnical investigations, while Mikhalkov devoted himself to geomagnetism. Shcherbakov and Labuntsov studied the minerals, Reichardt and Sokolov made large zoological collections. Nor should I forget our visitors who spent their holidays with us in order to do some mountaineering. They were Professor Schmidt, President of the Statistical Office, Public Prosecutor Krilenko, Mrs. Rozmirovich, and Dr. Rossels, a well-known surgeon. They helped in reconnoitring the glaciers and made the first crossing of the Yazgulam pass.

Dr. Reinig, the German zoologist, was not so much seeking new species as a rich harvest of facts concerning three biological questions: variation according to locality; conditions of local races (biotopes); vertical distribution. In the Pamirs, as in all mountainous countries, high natural boundaries favour the development of local races. This can best be seen by paying attention to animals with a known tendency towards variation. Reinig therefore carefully tracked down bumble-bees (*Bombus*) and the big beetles of the genus *Carabus*. In the Central Pamirs bumble-bees are found nesting as high as 4800 m., although the soil is permanently frozen. The nests are therefore quite close to the surface warmed by the sun.

Dr. Lentz penetrated deeply into the mysteries of the Pamir dialects spoken by the mountain Tajiks or Galchas of Shugnan, Rushan, etc. These languages belong to the East Iranian branch. It is high time that science took stock of them, for they are in danger of being swamped by New Persian, Russian, or some nondescript caravan language. The political and economic opening up of the high valleys is making great strides, so that the original traits of national life and character will soon be blurred. Dr. Lentz was surprised by the wealth of oral literature in verse and prose which he found in the miserable villages of the Bartang. He has brought home a great collection of texts together with phonographic and musical records. His scientific report will show a great step forward in our knowledge of an ancient people.

Among the more conspicuous objects of Tajik handicraft are the woollen stockings and the ceremonial veils or chashband. The many-hued stockings on which the svastica often recurs remind one of Fair Isle work. The women go unveiled but wear a beautifully embroidered face-curtain for the marriage ceremony. The outstanding ornamental symbol is that of the red cock. Some of these chashbands are hundreds of years old.

Marco Polo's sheep are not yet threatened by extinction, and in some places are even plentiful. Vast stretches of the Pamirs are so thinly populated that even modern weapons in the hands of the natives do not mean a wholesale destruction of game. Nor can the dangerous occasional sportsman (official, trader, soldier) travel very far afield owing to the difficulty of obtaining food or shelter. Roughly the boundary between *Ovis poli* and ibex coincides with the geographical boundary between the Pamirs proper and the marginal or alpine ranges (central and peripheral districts). Polo's sheep prefer the vast undulations of sloping hills rising thousands of feet above the flat bottoms of the Pamirs. Ibex prefer rocky ridges. The sheep can climb very well but do not care to do so as a rule, probably owing to their great size and weight. Kokjar is one of the places where the habitats of the two meet, as can be seen from the horns lying on the ground. But whereas the sheep strictly

confine themselves to the Pamirs, the ibex penetrate into the interior wherever jagged crests and pinnacles offer them suitable conditions. Thus we find them on the southern peninsula of the Great Qara K l among the blistered rocks of a mountain desert which might just as well be in the Sahara 12,000 feet lower down. Ibex are prone to form local varieties. The horns of the Sauk Dara seemed to me to be bent in a narrower circle than those from other valleys. Various valleys of the western ranges simply swarm with these noble animals, so that one often meets herds of a hundred head and more. During several days at tea-time I was able to watch a small herd from Dust Camp, feeding on a high ridge. The Qirghiz told me that at Kokjar, besides sheep and ibex, one finds markhor and a "goat with small, short horns."

The traveller who scans the mountain side for a likely camping-ground with shelter and fuel is quick to notice the presence or absence of the juniper tree, which is the most familiar boundary-post between the inner and outer climate. The Pamirs are quite treeless, with the exception of a few famous clumps of willows. The juniper also strictly avoids all the slopes and valleys facing the Pamirs as for instance the south side of the Alai range. But as soon as one has crossed the Taldik or Tengiz Bai northward bound, the slopes resume their characteristic spotted appearance. There is no juniper in the Tanimas valley, but plenty of it in the Kaindi valley. Below Daraut Qurghan the mountains on the left bank of the Qizil Su (facing north) are thickly sprinkled with juniper while those on the right bank remain bare. The difference between the inner and outer Pamirs is here carried on, as it were, for some time longer by the contrast between north and south exposure. Still farther west the juniper does not show quite so marked a preference for the shady side.

As to the orographical and glacial features of our field of exploration, I was struck by many curious facts which to my great regret I was unable to examine systematically, my time being taken up by general staff work. I did not climb more than a few insignificant hills, the highest of which was 5500 m.

The most prominent curiosity is, of course, the Fedchenko glacier stretching for 40 miles along the eastern flank of the Sel Tau chain. Its embryonic bed was probably sketched out by a fault which need not have been very big as long as it was continuous, a small crack being sufficient to guide erosion. This fault may correspond to the one running along the western declivity. The climatic watershed of the Sel Tau did the rest. It absorbs nearly the whole of the precipitation coming from the west. The whole of the rainfall need not necessarily be caught by the side turned towards the area of evaporation. On the contrary, only after passing the crest, the clouds, now thoroughly cooled, will be ready to shed the larger portion of their load. But they do seem to shed it very quickly, as is shown by the astonishingly low rainfall of the Pamirs, 62 mm. or barely 2 inches yearly. From Dust Camp I often saw bad weather on the Tanimas pass, but the clouds never passed me on their way eastwards. Nearing the meridian of Dust Camp they dissolved, leaving a blue sky above me. Bad weather on the Pamirs such as I met during my ride from the Great Qara K l to Kokjar at the beginning of July consisted of short, sharp showers lasting five or ten minutes. It was "bad weather with little rain." To the question "What is the Fedchenko glacier?" one may therefore answer, "It is the snow which has not reached the Pamirs."

In a general way the glaciers of the Sel Tau are longer and more alpine in character than those of the range of Peter the Great, although their ends also show the usual snout of dead ice covered with rubble. But this dead ice is less honeycombed than that of the Garmo or Zarafshan glaciers. The front of the Notgemeinschaft glacier forms an enormous fan-shaped landscape of high ice-cones hidden under blocks precariously balanced, but with only a few of those deep funnels with lakes at their bottoms so typical of the Garmo or Zarafshan. On the other hand, the Sel Tau glaciers boast of white-ice pinnacles the like of which I had never seen before in Turkistan, the white ice of the western glaciers being comparatively smooth. Towards the lower ends of the long glaciers these pinnacles often reach a height of 50 or 60 feet. They are arranged in rows corresponding to the junctions of tributary glaciers, so that their origin may partly be due to greater density owing to pressure, and partly to protection by medial moraine. The sun chiselled these ridges into shapes which at first bear a close resemblance to penitentes. Glacier penitentes and *névé* penitentes are of course the same, as far as the sun comes into play. Glacier penitentes run in rows corresponding to medial moraines, while *névé* penitentes follow the melting furrows of old snow.

As summer advances the surface of the snowfields turns into crackly foam, reminding one of the porcelain lace which one sees on figures of Dresden china. It makes going exceedingly disagreeable. From this there are innumerable transitions to the original and genuine penitentes of the Andes, namely isolated pillars, single or in rows, riding on screens. Those I saw favoured a south-eastern exposure. The climatic contrasts leading to these conditions—the heat desert of the lowlands sharply dovetailed into the cold desert of the highlands—are best illustrated by a curious combination which I found near the third glacier of the Tanimas valley. There an expanse of grey sand-dunes lay on the top of a floe of dead ice. It is these contrasts which make me believe in the great importance of the Alai-Pamirs to students of glaciology.

Round the Great Qara Kōl and in the neighbourhood of the Tanimas pass one cannot fail to notice a certain resemblance to Arctic landscapes, say those of Greenland or Spitsbergen. Here one also finds the type of glacier known as the carapace as opposed to the snout-glacier. Enormous lobes of *névé*, instead of tending towards some depression and there forming a tongue, end abruptly in a vertical ice-edge about 10 feet high and often a mile or more in length. Snowfields of the Alpine type are usually frayed, a belt of snow-patches leading over to the dry slopes below. All the glaciers near the Tanimas pass come out of short corries and at their mouth suddenly spread out into large flat cakes. Where not impeded by old moraines and dead ice, these pancakes join together, notably on the top of the pass, where they also merge into the bay or overflow of the Fedchenko glacier, forming a vast Arctic expanse with ice-swamps.

Thus the top of the Tanimas pass is level with the surface of the Fedchenko glacier which pushes a slight bulge into the gap, causing a moderate overflow. A glacial tide in the Fedchenko basin will therefore give rise to a bifurcation and to a big Tanimas glacier. This then would explain the present width of the Tanimas valley, which to-day may be compared to a withered branch. The old Tanimas glacier must have pushed on into the Kokjar valley, there

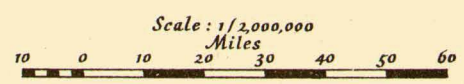
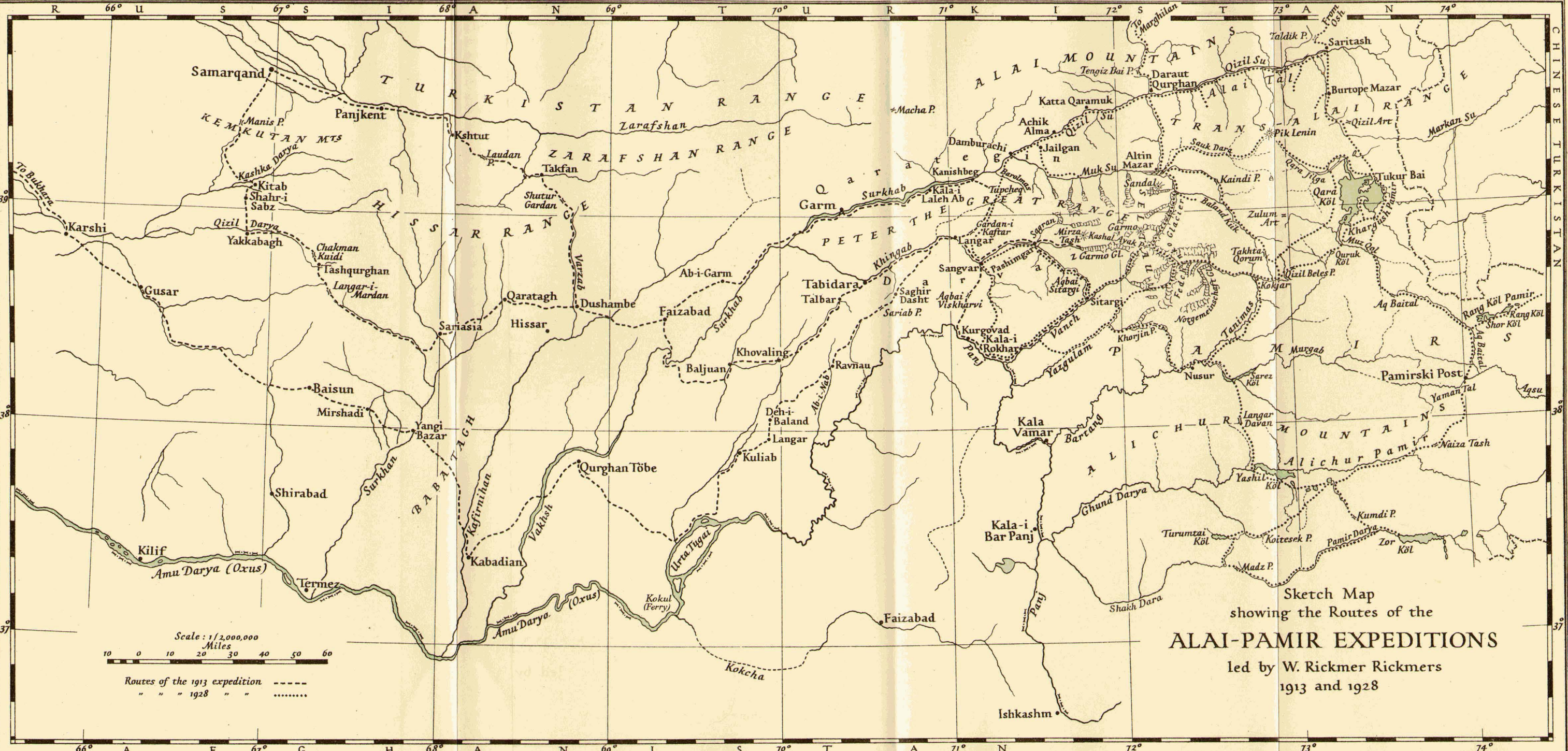
being no other explanation for the landscape of terminal moraines in the flat basin east of Kokjar and the conglomerates which choke the gorge below Kokjar. To-day, with a few insignificant exceptions, the lateral glaciers of the Tanimas valley are all on the right or southern bank. Their ends form bars across the valley, leaving dry stretches in between. Any one conversant with the habits of glaciers will guess at once that this state of affairs must be the cause of catastrophes. This agrees with the native tradition of frequent and disastrous floods in the Bartang valley.

The Tanimas is the only big river which flows eastward at right angles from the Sel Tau for a considerable distance before it turns round and escapes by running along the range as the Bartang. The Pamirs as a whole form a kind of shelf slightly inclined towards the west, the watershed being that long line of low hills along which runs the Russo-Chinese boundary. The inner sides of the marginal ranges—Alai, Tagarma, Hindu Kush, Sel Tau—are drained by rivers sidling along the ranges, pressed against them, so to speak, by the compact block of the Pamirs. The Muk Su forms no exception to this rule, only that its upper reaches are not a river but a glacier, the Fedchenko. North of the Tanimas all glaciers and rivers are right tributaries of the Fedchenko-Muk Su system. The Nalivkin glacier, the immediate neighbour of the upper Tanimas river, flows in the opposite direction to the Tanimas. Owing to these topographical peculiarities the Kashal Ayak pass gives access to the north and to the south. Whoever crosses it from the Vanch valley has the choice of two routes, one leading down the Fedchenko glacier to Altin Mazar, the other over the Tanimas pass to the Bartang valley or to the Pamirs *via* Kokjar.

The Sauk Dara glacier repeats the tendency of the Fedchenko on a smaller scale. Hugging the southern flank of the Trans-Alai it does not curl round to the watershed until well past Pik Lenin. Our mountaineers coming from the west accomplished the final ascent from a saddle (5700 m.) on the eastern side of the peak.

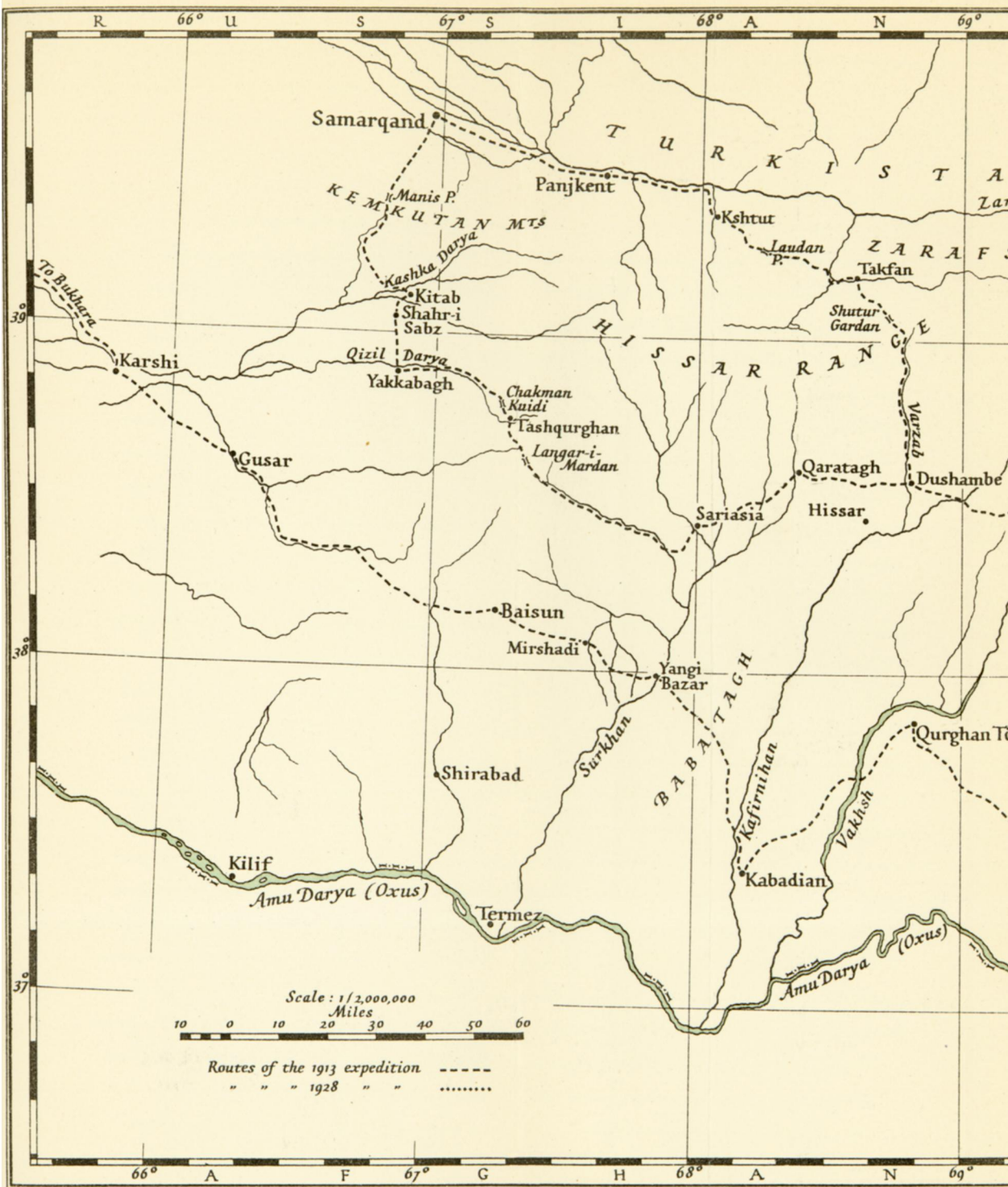
DISCUSSION

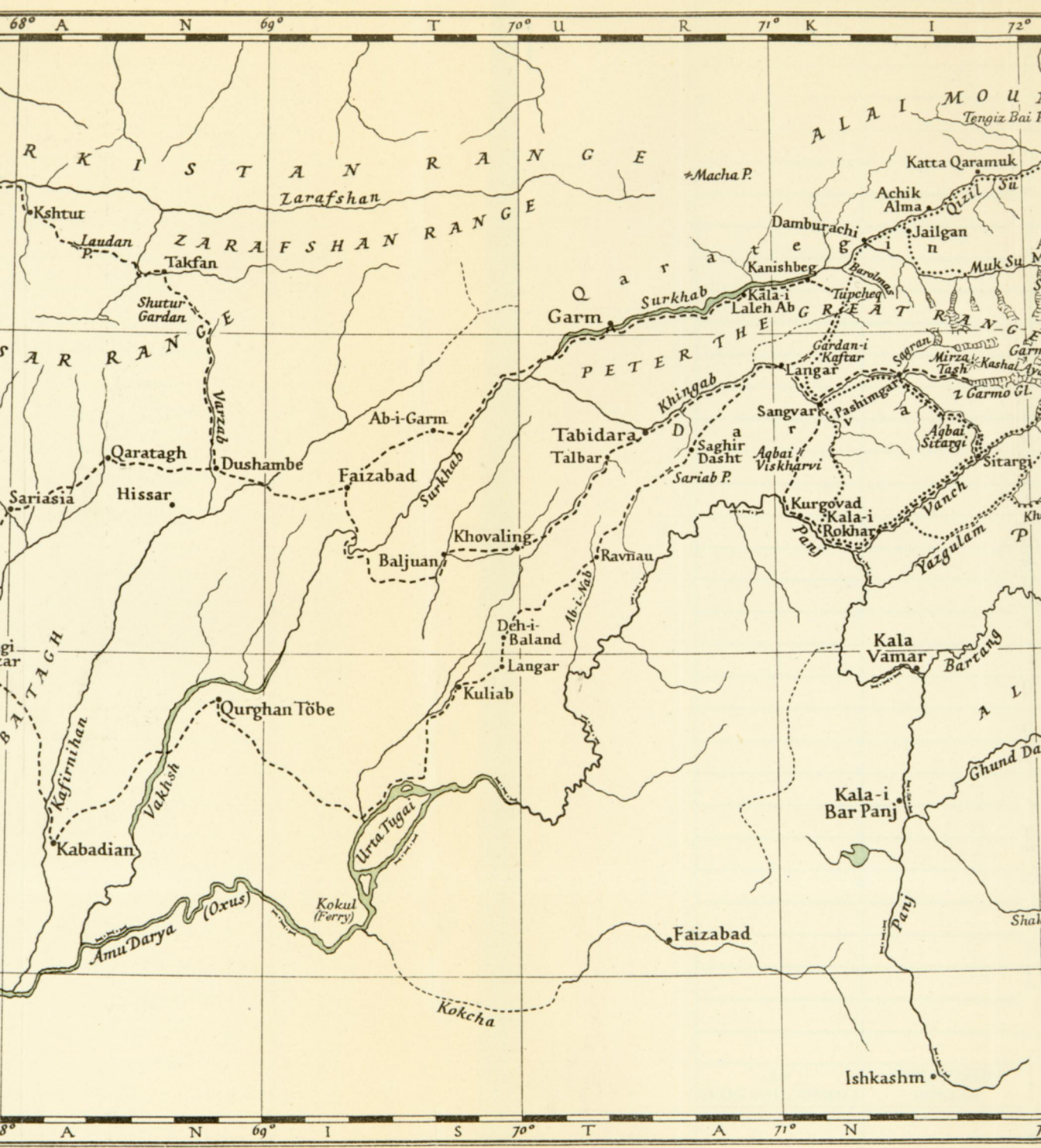
Before the paper the PRESIDENT (Colonel Sir CHARLES CLOSE) said: Mr. Rickmers is to address us to-night on two journeys in Central Asia. The last journey in particular was begun on the western edge of the Pamirs. At an early age Mr. Rickmers took an interest in Central Asia and made some excellent journeys there. He is well known to us as the author of a book on 'The Duab of Turkestan,' which was published by the Cambridge University Press. Just before the war he had arranged, with a distinguished past-President of this Society, to go out to the Caucasus on an expedition; but about that time he was obliged to go to Vienna to be operated on for appendicitis. He was told by an expert that he could be made fit to travel in a fortnight, and so he was. But just when he was all right, the war broke out. Now, it was really very fortunate that our past-President and Mr. Rickmers were not together in those parts of the world, because they might have had to wage a private war of their own. I might add that Mr. Rickmers' father was a native of Heligoland. At one time I thought Mr. Rickmers himself had been born there, but he tells me that is not the case. Of course, we all know that in the '90's the nationality of that island was changed. Mr. Rickmers is a member of the Alpine Club, and he comes back to us as an old friend, for he lectured to the Society thirty years ago.



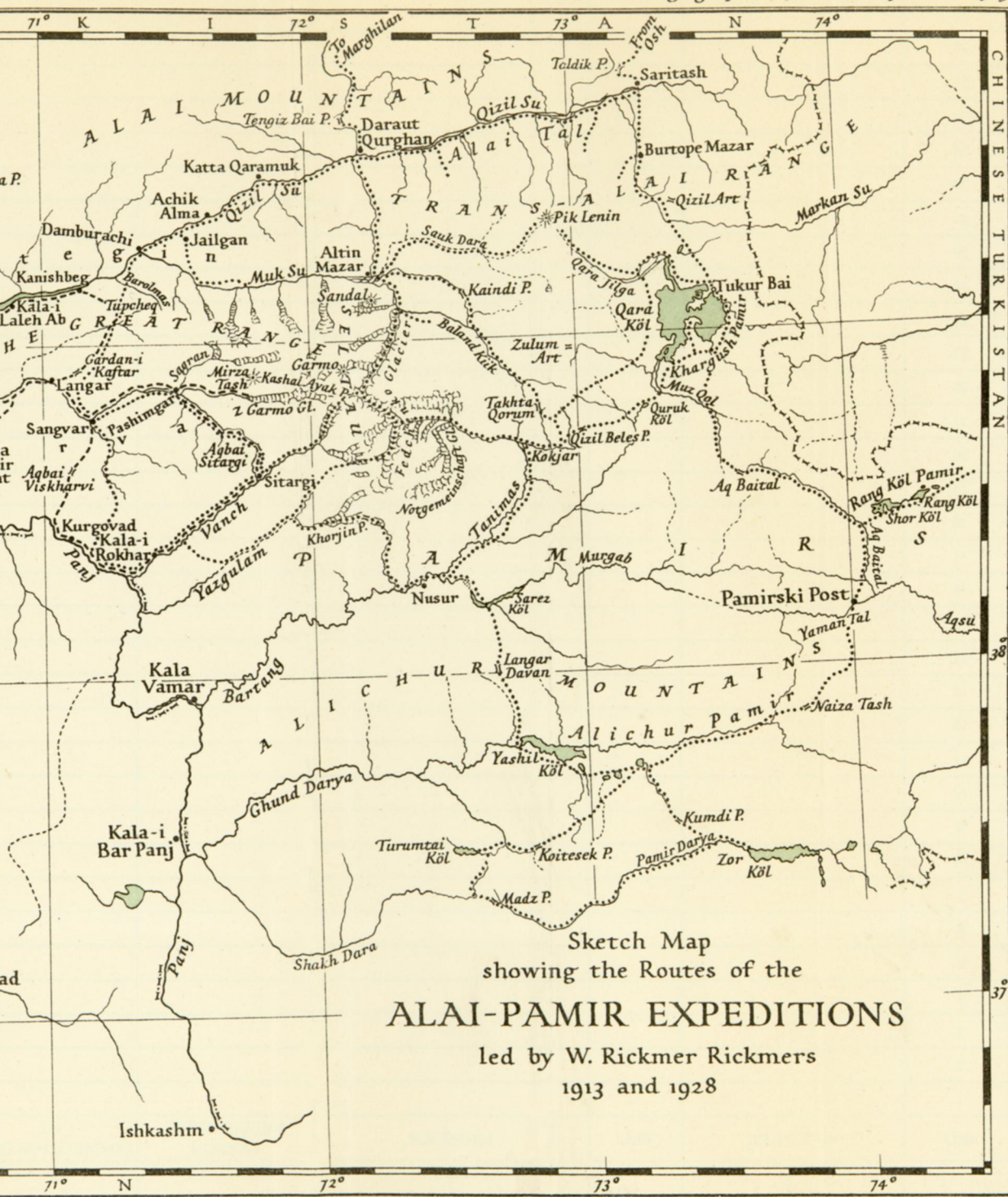
Routes of the 1913 expedition - - - - -
 " " " 1928 " "

Sketch Map
 showing the Routes of the
ALAI-PAMIR EXPEDITIONS
 led by W. Rickmer Rickmers
 1913 and 1928





Published by the Royal Geographical Society



Sketch Map
 showing the Routes of the
ALAI-PAMIR EXPEDITIONS
 led by W. Rickmer Rickmers
 1913 and 1928

Mr. Rickmers then delivered his lecture, and a discussion followed.

Sir FRANCIS YOUNGHUSBAND: Mr. Rickmers said at the beginning of his lecture that the Pamirs was a word not to be mentioned on account of its political significance. Well, I was there when it was an exceedingly burning question, because in the year 1889 when I was first on the Taghdumbash Pamir, and in 1880 and 1890 on the Great Pamir and the Great Qara K l lake, it was a question whether the inhabitants of that part were under the aegis of the Chinese or Afghans. They were all nomadic Qirghiz who were accustomed to bring their flocks up to graze on whatever they could find on those open valleys. They then owed allegiance, sometimes to the Chinese, sometimes to the Afghans, and it was exceedingly important for us in India to know whether the Russians would come and take them, or whether they would come under the Chinese. In the year 1891 the Russians did come down. They came across from the Altai valley over the Qara K l lake that Mr. Rickmers has shown; they came down to the Great Pamir and Little Pamir and actually crossed the Hindu Kush range on to the Indian side of the great watershed. They came by the Baroghil pass and went back by a pass whose name I have forgotten. As I say, it was then a burning question.

As to the character of those Pamirs, I think from what Mr. Rickmers has described in words and from the beautiful pictures which he has shown, you will have gathered a thoroughly accurate impression. They are great wide open valleys, sometimes 5, 6, 8 or 10 miles in width, almost flat at the bottom and with mountain ranges on either side. Unfortunately the photographs give a wrong impression because they give altogether too low an idea of the height of the mountains. That is the fault of all photographs. I saw a photograph of the Qara K l lake and there was a comparatively small range of mountains encircling it. As a matter of fact, it is a most beautiful range of snowy mountains, as I have it in my mind now nearly forty years after first seeing it. On those valleys there is very little to find in the way of fodder, but somehow the Qirghiz flocks, like those in Tibet, find something to graze on. Thus one finds little encampments of nomadic Qirghiz in their tents who seemed, certainly in my time, very well to do, and who had not then given up the custom—and I do not think they have yet—of wearing beautifully coloured dresses. Also in their tents they had beautiful carpets on the floor and round the walls. I was given a tent belonging to a Qirghiz chief to sleep in one night; it was really magnificently carpeted both on the floor and round the walls. I bought it from him in exchange for a carbine.

Mr. Rickmers noted the difference between expeditions then and now. In my time it was almost a necessity that one should go alone or with one companion. Now all that pioneer work has been done; expeditions are able to lay out beforehand a plan of operations, and we thus have such beautifully organized expeditions as Mr. Rickmers has described, with a leader who does all the organizing work. Although Mr. Rickmers has not said so, you can see how he has organized it all, leaving the various experts—zoologist, botanist, geologist, etc.—free to go about their particular jobs. That seems to be the method of exploration at the present moment, and of that method I gather the expedition that Mr. Rickmers has described this evening is a very notable example. I congratulate him very much indeed upon the excellent work he has done and the lecture he has given, which conveys to us a splendid idea of the type of country that he has examined.

The PRESIDENT: Dr. Longstaff is with us to-night. He has been within 150 miles of the country Mr. Rickmers has described, and, therefore is fairly well qualified to take part in the discussion. Will he add a few words?

Dr. LONGSTAFF: My principal reason for responding to the President's invitation is the pleasure it gives me to speak on this occasion. I have had the privilege of the friendship of Mr. and Mrs. Rickmers for thirty years. Those of you who are interested in mountaineering will remember that in 1903 Mr. Rickmers led a party of celebrated German-Austrian mountaineers to the Caucasus. At the same time Rolleston and I independently went to the Caucasus. Both parties were of that happy age when personal rivalry is sweetest. We were racing each other for the last big batch of Caucasian peaks which remained unclimbed. Rickmers and his party were already in Suanetia. Rolleston and I had a very elementary knowledge of Russian, and we only had one Georgian servant. There is one awkward little bit of the journey after leaving the railway and civilization at Kutais to get into "Free" Suanetia, which was then unadministered territory. When Rolleston and I arrived at Kutais, eager to beat the German-Austrian climbers who were already established in Suanetia, we found Rickmers had sent his dragoman to meet us at Kutais in order that we might lose no time in commencing the competition! I think that is typical of Rickmers: he is well known as a thoroughgoing sportsman. Probably that is the reason why he is able to manage these large mixed parties on such expeditions as that of which we have heard to-night.

Now you will not want to hear much from me. I have not been within 100 miles of Qara K l, but on the fringe of the Afghan Pamir; that is, on its mountain fringe. I advise all those who are in any way interested in the subject to make a point of reading Mr. Rickmers' paper when it appears in the *Journal*, for he has not read it to-night. You have heard his very interesting description of the cold desert meeting the hot or dry desert, and you get there an interesting interplay of many things which I must not now go into. Then there is the great Fedchenko glacier, which is probably 40 miles long; in fact, it is the second longest glacier in the world, outside the Polar regions and Alaska. The biggest glacier is the Siachen in upper Nubra, which is exactly 45 miles long and was discovered in 1909. The Fedchenko glacier, as far as I can make out from Rickmers' maps, is 40 miles long; the only other possible competitor is the Inilchek glacier, explored by Merzbacher in the Central Tian Shan. The Fedchenko glacier was discovered in the year 1928, so exploring is not yet by any means played out; its discovery was due to Rickmers' topographical insight.

Then there is Mount Kaufmann. I have not any patience with those who want to change the name Mount Kaufmann—the name of the great Governor-General of Russian Turkistan—to commemorate a politician. We must have an authoritative account for the *Alpine Journal* of this great ascent. Rickmers and I are both members of the Alpine Club and we are not supposed to talk about records, I know. You either get to the top of a mountain or you do not; and if you don't quite get to the top it isn't strictly an "ascent." Well, the record for twenty-one years has been Trisul, which is about 23,400 feet, a well-known peak in the Himalaya that was climbed to celebrate the Jubilee of the Alpine Club in 1907. We selected it for that purpose, because we knew that it was higher than any other mountain that had incontestably been climbed to the very top. Now, it is quite probable that Mount Kaufmann is as much as 50 metres higher; I think it is probably 7150 metres high. All the authorities give it as either 23,000 feet or 7000 metres, but I think this is an approximate value only. No doubt it will be in time accurately fixed, and I should not be surprised if it is a few metres higher than Trisul. Then Rickmers will have had also this to the credit of his expedition, that it is the highest mountain that anybody has ever succeeded in getting to the top of. Therefore from the point of view of a mere mountaineer I consider that that is very likely to prove a record,

and I am very happy indeed to be the first to congratulate my old friend on establishing what I believe to be a new record in the annals of mountaineering. I ask him to convey my heartiest congratulations to the climbing party on the accomplishment of a great ascent.

The PRESIDENT: When dealing with these great peaks we cannot be certain, within 100 feet or so, as to what the exact height is. I will not go into the technical reasons for that, but all who have studied the question of heights of mountains will know very well that we are, relatively, uncertain. We can call Everest 29,002, with a variation of 100 feet or so, and we shall not be very far wrong. There are special reasons why we do not know the exact height or how to define the exact height of these mountains. But whether the higher be Trisul or Kaufmann, we are quite sure that the climbing of each was a very fine feat, and we congratulate both Dr. Longstaff and Mr. Rickmers' party on their achievements.

Mr. Rickmers has clearly showed to us the advantage of a well-organized expedition. The sort of expedition he has described reminds us of what would be a well-organized boundary commission nowadays with its various experts and with a leader who has not only the duty of plunging his head into boxes containing food, as Mr. Rickmers observed, but other duties besides. On the purely technical questions and the use of photography, I was very glad to find that such a large area had been surveyed by Mr. Rickmers' party. He has given us a clear instance of the advantage of good organization for work over a relatively limited space, and the world is not yet fully explored: very far from it. Mr. Rickmers mentioned that there were still some native tribes, totally unknown, which expected any day to be discovered. We may, perhaps, hope that they won't be discovered yet a-while. I thank Mr. Rickmers, in the name of the Society, for an admirable lecture, and congratulate him on the excellent work that his party carried out.

[We are indebted to Mr. Rickmers for the opportunity which he has given us of obtaining for the Society's collection prints of a large number of photographs taken on the 1913 and 1928 expeditions. Among these are photographs of the snouts of the following glaciers: Garmo, Sildi, Fedchenko, Notgemeinschaft and Glacier III, Tanimas. These may prove useful records in future studies of the glaciers of the region.—ED. G.Ź.]