Report on the Expedition to Kamet, 1920
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Source: *The Geographical Journal*, Vol. 57, No. 3 (Mar., 1921), pp. 213-219
Published by: geographicalj
Stable URL: http://www.jstor.org/stable/1780865
Accessed: 26-06-2016 13:22 UTC

denominate the summits of Olympus which protect them from the north wind.

Thus, to sum up, the High Olympus is constituted by two ranges, which, though not parallel, run generally east and west. The northern range is that of Kokkino-Vrako, the southern, that of Bichtes. A high rocky barrier running north and south contains three "stones," three "pipes," or three "brothers," quite separated from each other, the Tarpeian Rock in the south, the Throne of Zeus in the north, and in the centre the Venizelos peak, the highest of the three. The point of junction between this barrier and the northern range is the St. Elias. The joint which unites the central peaks with the southern range is more complicated. It includes the Skolion, which forms the counterpart to the St. Elias on the opposite side of the Megali-Gurna, and the Isto-Cristaci more to the west. The St. Anthony and the domes of Stavoïdia link these two summits to those at the western end of the southern range, of which the Sarai is the most important.

I may conclude with the hope that the geographers of the future may not have to correct at too many points the imperfect sketch here traced of the high abode of the gods.

REPORT ON THE EXPEDITION TO KAMET, 1920

Major H. T. Morshead, D.S.O., R.E., Offg. Deputy Superintendent, Survey of India

The following extracts from Major Morshead's report to the Surveyor-General of India are published by permission of the Surveyor-General to supplement the brief narrative given by Dr. Kellas in his report to the Oxygen Research Committee, of which a summary was published in the February Journal.

THE mountain known in India as Kamet and to the Tibetans as Kangmed * or Abi Gamin—the 30th in order of magnitude of the known high peaks of Asia and of the world—is in lat. 30° 55′ and long. 79° 36′, in the Garhwal district of the United Provinces, just south of the Tibetan border. Rising to a height of 25,445 feet, it forms the culminating point of the Zaskar range—a northern bifurcation of the Great Himalaya—and, though forming a conspicuous landmark from the Tibetan province of Ngari Khorsum on the north, yet from the south, owing to its position behind the Great Himalayan Range, its appearance is so modest that till 1849 it remained unnoticed and unmeasured, though but 250 feet lower than the king of the Kumaon Himalaya, Nanda Devi.†

* Kangmed = "the lower snows," as distinguished from the higher snows of the Kailas Range, culminating in Mount Gurla Mandhata 100 miles to the E.S.E. The name has, I think erroneously, been spelled Kangmen in N. Frontier ¼-inch Sheet No. 9 N.E., and on the R.G.S. map of Tibet.

† Burrard and Hayden, 'A Sketch of the Geography, etc., of the Himalaya Mountains.' Kamet now shares the 30th place on the world's list of high peaks with Namcha Barwa, the mountain of identical height overlooking the big bend of the Tsangpo river in the Assam Himalaya, which was discovered in 1912.

The earliest attempted ascent of Kamet was made in Jnne 1855 by the brothers A. and R. Schlagintweit, who reached a height of 22,240 feet on a mountain which they called Ibi Gamin, and believed to be identical with Kamet. Subsequent investigation has, however, tended to the belief that the mountain on which they actually climbed must have been the satellite known as E. Abi Gamin, or Strachey's peak (24,180 feet).

During the succeeding half-century the only recorded adventurers on the mountain are the members of the Great Trigonometrical Survey who triangulated and mapped the area in the years 1872–75. It was near here in the latter year that the late Mr. I. S. Pocock made what remains to this day one of the world's highest plane-table fixings—setting up his board at 22,040 feet.*

In recent times numerous attempts have been made on the mountain. The approaches both from the east and the west were reconnoitred in July and August 1907 by Messrs. Bruce, Longstaff, and Mumm ; but serious climbing was prevented by the onset of an unusually violent monsoon. Mr. C. F. Meade, accompanied by Alpine guides, made three strenuous efforts to conquer the mountain in 1910, 1912, and 1913. On the latter occasion, approaching *viâ* the Raikane valley he succeeded in reaching the col ("Meade's saddle," 23,500 feet) between Kamet and E. Abi Gamin, when his party succumbed to mountain sickness just as success seemed within their grasp.

The late Captain A. L. Slingsby twice attacked the mountain unsuccessfully from the western side, while Dr. A. M. Kellas also reconnoitred the western approaches in 1911 and again in 1914—the expedition in the latter year, which had for its special object the scientific investigation of the effects of high altitude on the human body, being summarily cut short by the outbreak of war.

On the conclusion of peace Dr. Kellas resumed the experiments cut short in 1914, and further arranged for the loan of oxygen cylinders and other scientific apparatus from the Oxygen Research Committee in England, for its despatch to Bombay through the agency of the India Office Stores Department, and for the assistance of the Survey of India in taking delivery of the apparatus in Bombay and transporting it by rail and coolie *viâ* Kathgodam to the base of the mountain beyond the extreme Himalayan village of Niti.

I was fortunate enough to be deputed for the latter task, together with Mr. Laltan Khan of the Survey of India Upper Subordinate Service.

It was hoped that the apparatus might have arrived from England by the end of June, so as to enable Niti to be reached by easy stages on about August 7. This would allow of the remainder of the month of August being devoted to laying out advanced depôts of oxygen cylinders, firewood, etc., as far forward as climatic conditions admitted, with a view to utilizing the first fine weather after the monsoon for the final climb, before the arrival of the winter snow. These plans were unfortunately frustrated by a very serious delay in the shipping of the oxygen cylinders—due, apparently, to the unexpected decision of the shipping authorities in England to classify the cargo as "high explosives." Consequently it was not until early August that the kit reached Kathgodam—whence, after hastily repacking the cylinders into loads suitable for coolie transport, the expedition started in pouring rain on August 8.

This unfortunate delay at the start involved the complete abandonment of Dr. Kellas' plans for comparative observations on acclimatization *en route*, and the paramount consideration now became that of pushing forward with all

* 'General Report on the G.T. Survey of India during 1874–75.' I have searched the original plane-table sections of this area in vain in the hope of discovering the exact site of this fixing.

possible speed in the endeavour to reach the high ground before the onset of winter conditions; leaving the comparative observations for the return journey. Travelling *viâ* the rolling hills and fertile stuffy valleys of Kumaon, we reached Joshimath on August 22, and Niti five days later. Here we halted for a day to arrange for food supplies and for permanent coolies and yaks for our further progress.

Resuming our journey on the 29th with a retinue of twenty-four yaks and forty coolies, we encountered our first obstacle on the following day in the shape of the unfordable Dhauli river, which separated us from the Raikane valley at the confluence of the latter river. This necessitated a day's halt while the coolies constructed a cantilever bridge, the timbers for which had to be fetched from the tree-zone below Niti.

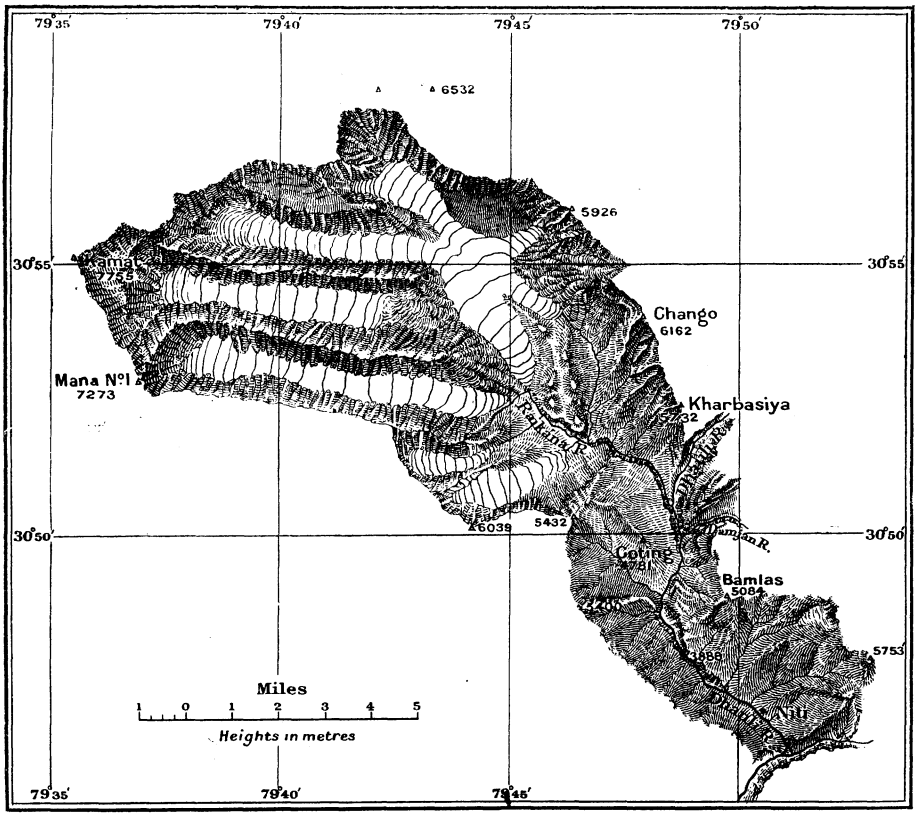
The foot of the Raikane glacier was reached on September 1. Dwarf juniper scrub (*bhitaru*) grows plentifully in this neighbourhood and forms an excellent fuel, which can be pulled up by hand by the roots without the use of an axe, and burns with a pleasant aromatic odour. Above this point no further fuel occurs, nor is the valley passable for yaks. We accordingly made this our base camp (15,380 feet), and determined on a brief halt, in which survey operations and scientific observations could be carried on, while the coolies collected a reserve of fuel for our needs on the mountain. The yaks meantime returned to Niti for fresh supplies of provisions.

Marmots abound in the Raikane valley, and some excitement was caused on our first arrival at the base camp by one of my khalasis catching a tailless "mouse-hare" in his hat. The alpine flowers on the hillsides made a striking and memorable display in their brief autumn glory—edelweiss, fleshy-leaved saxifrages, blue cranesbill, yellow and orange ranunculus, and dwarf primula being among the commonest and most conspicuous.

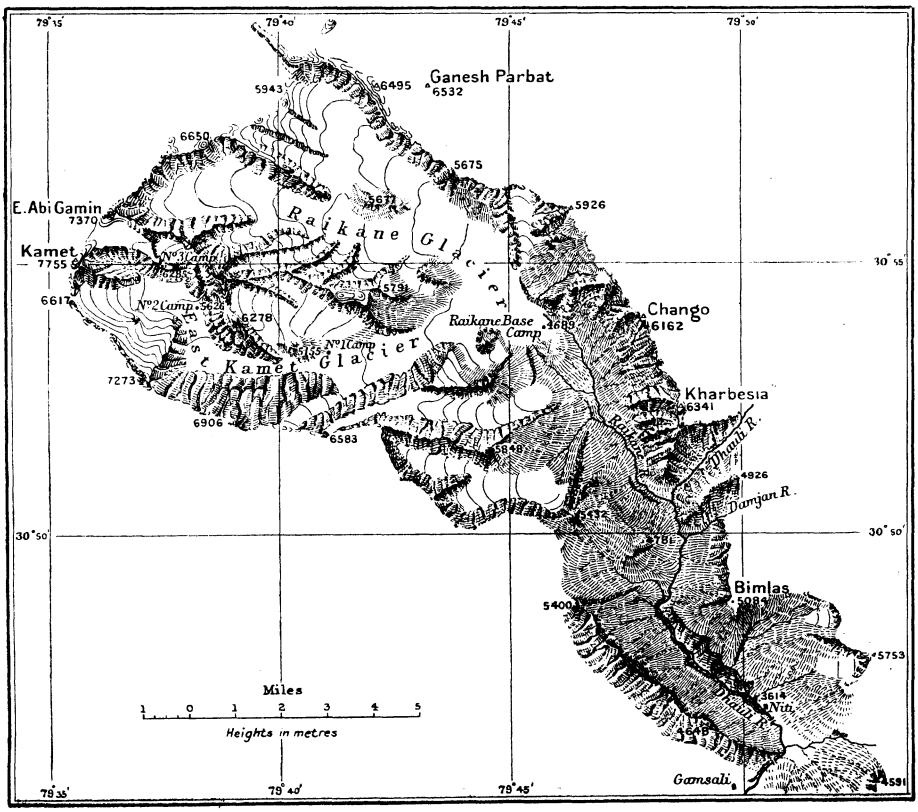
The thermometer at this altitude usually registered 6 or 8 degrees of frost each night, while the morning spectacle of a powdering of fresh snow covering the hillsides down to 16,000 or 17,000 feet served to remind us that winter was at hand, and that our sojourn on the higher slopes must perforce be brief.

From the Raikane base camp our route was identical with that of C. F. Meade in 1913, and led over the moraines and crevasses of the east Kamet glacier for a distance of 10 miles. Frequent and terrific avalanches from the steep southern and western faces of the valley are a feature of this portion of the route, and form a danger to incautious travellers; safe camping sites may be found, however, here and there on the opposite side of the valley. We were fortunate in having with us some of Meade's old coolies, whose knowledge of previous camping-grounds proved invaluable, and I am glad to take this opportunity of acknowledging our indebtedness to his gallant pioneering. Profiting, however, by Meade's experiences of mountain sickness after a series of long and rapid marches, we decided on adopting a programme of short and easy stages with frequent days of halting for acclimatization, which latter incidentally enabled the coolies to return for further supplies of much-needed fuel and provisions. Advancing in this manner, on September 10 we reached a camping-ground at 18,460 feet, beyond which the route leaves the main glacier and ascends a steep side valley.

The only incident worthy of mention in this portion of the trip was the loss of two live sheep by slipping through the thin mantle of snow which concealed one of the numerous large crevasses of the glacier. Two and a half days later we managed to lower a coolie by a rope 40 feet into the crevasse, whence he succeeded after half an hour's work with an ice-axe in releasing the two sheep,



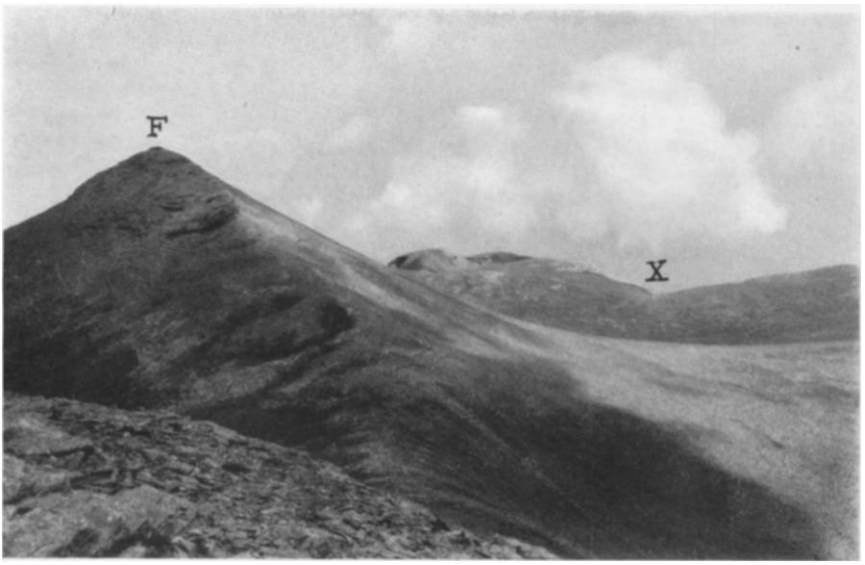
The Kamet Glaciers from Sheet 19, 1 inch to mile, Survey of India, 1878



The Kamet Glaciers as surveyed 1920 by Mr. Laltan Khan

3. THE SUMMITS OF OLYMPUS AND THE TRANI GURNA FROM SALA TULA
G : Pic Jacques Philippe ; H : Skolion ; J : Tête noire. Other points as in Plate 2

4. SKOLION FROM THE BREACH AT K, PLATE 2



5. SAINT ELIAS, THE PRAIRIE DES DIEUX, AND THE PORTA (X) FROM POINT G

which were hauled to the surface—one still alive, and one reduced to frozen mutton.

On September 11 we advanced a further 2 miles and pitched a light camp on rock at a height of 20,620 feet. The majority of the coolies showed signs of distress and complained of violent headaches on arrival at this altitude; we accordingly sent them back to the last camp, keeping only two as guides for the 600 feet of rock climbing which lay ahead. After a day's halt for acclimatization we successfully reconnoitred the rock face on the 13th, finally emerging at the top on to a smooth dome of glassy ice, up which we had time to cut forty-five large steps before returning to camp—a delightful day of real mountaineering.

Next morning the thermometer recorded 28 degrees of frost, while the small patch of rock around our tents was white with freshly fallen snow. Both Kellas' and my own servants were at this period completely *hors de combat* from the effects of the cold, and we had the greatest difficulty in preparing ourselves any cooked food. The daily convoy of provisions and firewood ceased to function in the absence of responsible superintendence at the various posts on our line of communication, and this in turn reacted on the spirits of our coolie guides, who became extremely despondent regarding the prospects of any further progress at this late season of the year.

Our position was manifestly too precarious to warrant any further advance pending an overhaul of the line of communication, and this I accordingly undertook at once. Retracing my steps down the valley on the 15th, I installed my own private servant, who now showed signs of convalescence, as commander of the Raikane base camp, with orders to institute a regular system of *chalans* or invoices notifying the daily number of loads of fuel and stores despatched. Dr. Kellas' servant took charge of the forwarding arrangements at No. 1 camp (16,915 feet), and Mr. Laltan Khan at No. 2 camp (18,460 feet).

This accomplished, I rejoined Dr. Kellas at camp No. 3 on September 17, and found that he had meanwhile got his two coolies to complete the thirty-five more ice-steps required to negotiate the difficult ice at the head of the rock-cliff. After waiting one day to ensure the arrival of the minimum necessary reserves of supplies, we advanced with very light kit and pitched our small single-fly tent on snow at 22,000 feet. Owing to sickness the number of coolies was now reduced to eight, who consequently had to descend again for the night to camp No. 3, returning next day with a second tent (for themselves) and a small supply of ready-cooked food. It was impossible to get firewood carried up the difficult rock-face which separated us from the camp below; both we and our coolies were dependent on food sent up ready cooked from below, aided by such cooking as could be done by a spirit stove in the shelter of the tent. The thermometer next morning registered a minimum night temperature of 15° below zero on the surface of the snow, and our blankets were as stiff as boards where one's breath had congealed on them. Rising from our beds on the snow was consequently more than the work of a moment. However, after heating ourselves a tin of soup on the spirit stove and thawing sufficient snow to fill the thermos flask with bovril, we started forward at 9 a.m.—our two selves and three coolies on the rope. Taking the lead in turns, and steering a winding course to avoid the giant crevasses, we gradually emerged on to the wide flat valley which separates Kamet from E. Abi Gamin. On our left the summit of Kamet showed clearly 2000 feet above us, connecting with the valley by two well-defined arêtes of easy slope, either of which must have been easily climbable had time permitted. It was now 3 p.m., however, and our coolies were dead beat, so after

a brief halt for food and a round of photographs we had to turn regretfully homewards from Meade's col, in order to avoid being benighted. The view from this col is magnificent, comprising the whole Tibetan portion of the Sutlej valley to the north, while 100 miles to the east-south-east the stupendous *massif* of Gurla Mandhata towered head and shoulders above the intervening army of lesser ranges.

Had we been able to induce the coolies to carry our camp one march further forward to the flat open *névé* near Meade's col, it is hard to believe that anything could have prevented our reaching the summit. Lack of properly cooked food, combined with the intense cold, had however undermined the stamina of the coolies, who absolutely refused to carry forward any further loads. My period of deputation had nearly expired, and realizing with regret that the season was now too far advanced for further efforts, I reluctantly bade good-bye to Dr. Kellas on September 22 and turned my steps towards home, reaching Dehra Dun by double marches on October 15—precisely two months from my date of departure.

Dr. Kellas, with Mr. Laltan Khan, remained a further month in Garhwal, and succeeded in completing the essentials of his scientific work, which form the subject of a separate report.

The fact that neither Dr. Kellas nor myself suffered the slightest discomfort at any time from mountain sickness, seems to indicate that our method of attack by a process of gradual acclimatization is correct. That it is essential also to avoid undue fatigue is shown by the fact that our coolies who were carrying daily loads suffered considerable discomfort from the effects of altitude.

It may be profitable to discuss briefly the reasons of our failure to reach the summit of the mountain. Undoubtedly the first and foremost cause was the lateness in the year, due to the unfortunate and unforeseen delay in the arrival of the oxygen cylinders from England.

A second cause lay in the failure of the Survey khalasis, recruited from the middle Himalayas, to stand the climate and altitude of the higher ranges. I had enlisted a dozen strong Garhwali khalasis, with the double object of forming a *corpus vile* for the scientific observations of Dr. Kellas, and of providing a *corps d'élite* of porters for the higher altitudes. With the latter object in view they had been lavishly equipped with warm clothing on the arctic scale. Unfortunately, one half of their number succumbed to mountain sickness at 15,000 feet, while the other half proved so extravagant of our precious firewood that they had to be sent back to the base camp, and their places taken by the hardier Bhotia men of Niti and the neighbouring villages. The provision of boots and warm clothing for the latter on the spur of the moment was however a matter of difficulty, and proved a direct contributory cause of our failure.

A third cause of failure must be traced to the inadequacy of our arrangements for cooking at the higher altitudes. I was unaware until too late that the large Primus stove, on which I had been relying, would not work in the rarefied atmosphere of 20,000 feet, beyond which point methylated spirit is the only possible fuel; while Dr. Kellas had only one small spirit stove which took an hour to thaw sufficient snow to fill a teapot. Had our equipment included a dozen large spirit stoves and two or three two-gallon petrol-cans full of methylated spirit, both our own and the coolies' cooking would have been assured.

I have nothing but praise for the Bhotia coolies of the higher Himalaya.

On rock they can climb like goats, while on ice they readily learn step-cutting. It appears very doubtful if the present-day expense of importing Alpine guides can ever justify their employment in future Himalayan exploration.

The oxygen apparatus forms the subject of a separate detailed report by Dr. Kellas. Neither of us felt the slightest need for artificial stimulants in the form either of oxygen or alcohol up to the highest point reached, and my impression is that one could have gone several thousand feet higher without distress of breathing, had other conditions admitted. On the other hand, the handicap of 15 lbs. additional weight of oxygen cylinder on one's back, supported by a system of tight belts and straps, proved more than I for one could cope with.

I obtained a special blue print on drawing-paper of the old 1-inch to the mile Sheet No. 19. This was mounted on a light 20″ × 20″ plane-table for Laltan Khan's use, 115 square miles of country were revised and contoured in modern style, disclosing considerable discrepancies in the old reconnaissance surveys. Roads, streams, and watersheds were found sometimes as much as ¾ mile in error, while the original surveyors had evidently never visited the upper portions of the Raikane and Kamet glaciers.

It only remains to express my gratitude at being privileged to serve my apprenticeship in mountaineering under so experienced a hand as Dr. Kellas. Failure is often more instructive than success, and I can only hope that this expedition, on which I shall always look back with feelings of pleasure, may be the prelude to other more successful future efforts in the same genial company.

DE SAUSSURE: REVIEW

The Life of Horace Benedict de Saussure.— **Douglas W. Freshfield, D.C.L.**, with the collaboration of **Henry F. Montagnier.** London: Edward Arnold. 1920. 8vo. Pp. xii., 465. *Portraits, Illustrations and Sketch-map.* 25*s. net.*

IT is remarkable that, although we have endless lives of minor men, the life of de Saussure awaited a biographer; for de Saussure was by no means either a minor man or a man whose activities would appeal only to a special public. A great mountaineer, a distinguished scientist, an educational reformer, the central figure in a distinguished society in Geneva during the last half of the eighteenth century, and finally a kindly gentleman—the life of such a man, if sufficient material has survived, should be interesting reading. Fortunately, the material has survived and been collected, and Mr. Freshfield has produced a book of which he should be proud. For many years he had contemplated writing the life of de Saussure. From time to time, however, he was deterred by the difficulty of collecting all the material necessary, for researches had to be made among the family papers and public archives in Geneva and elsewhere. This difficulty was at last overcome by the kindness of Mr. H. F. Montagnier. "Mr. Montagnier, finding himself resident in Switzerland and debarred from active service during the Great War, has at his own suggestion employed his leisure in ransacking public libraries and obtaining access to private collections in quest of material bearing on de Saussure's career—scientific, Alpine, political, and social."

Mr. Freshfield's life of de Saussure is the result of many years' study. It has been written because he was keenly interested in the subject, and he has taken every care that it shall not be merely a collection of facts. As one