

it than any simple question of variable convergence, and I would maintain that we should accept it as a mysterious physiological fact and not attempt to explain it by geometry.

The PRESIDENT: Captain Hotine at the commencement of his admirable paper described how in the early days one was apt to mistake a hill on two photographs. I am afraid that even the plane-tableer does that sometimes. I remember in 1890 in Burma I was given a reconnaissance map made by a staff officer in which appeared a magnificent 5000-foot hill. When I came near the ground I found the hill non-existent; he had his two rays and had identified them wrongly. That might happen to anybody, even to a photographer. I was struck by the progress that has been made in the stereoscopic method. I remember when Mr. McCaw was in Fiji he took some stereoscopic photographs and sent them to Southampton, and we had the pleasure of trying to make a map from them. It was excessively difficult. In those days we used Major F. V. Thompson's machine, and it was difficult to get any sort of coincidence.

Mr. McCaw: Of course there were special difficulties in Fiji.

The PRESIDENT: But the progress has been very great. In reading up this subject I am struck with the difficulty of remembering the names given to these various machines. We have stereocartograph, autocartograph, photocartograph, and stereoplanigraph. It is hard to remember which machine you are dealing with. I wish some simpler form of nomenclature could be devised.

We are glad to hear from Captain Hotine that the British machine has the merit of simplicity. The general outcome of this sort of work is that we shall tend to employ, in future, a few skilled men as opposed to a large number of relatively unskilled men. We congratulate Captain Hotine on the development of the parallax grid, and are very grateful to him for the paper he has given us. I know you will show your appreciation in the usual way.

HIMALAYAN NOTES

I. Identification of Karakoram peaks by the stereoscope

MAJOR Kenneth Mason sends us tracings of two panoramas, F and I in Dr. De Filippi's 'Karakoram and Western Himalaya,' taken respectively from the ridge east of the Sella Pass, and from the southern ridge of Staircase Peak, and looking eastward over the Shaksgam valley to the country which he surveyed with the photo-theodolite in 1926. By a study of his pairs of photographs in the stereoscope he has been able to identify with certainty a large number of features in the panoramas taken on the Abruzzi expedition, and he remarks that without the stereoscope these identifications were not possible, while with it they were fairly obvious.

II. An unpublished report on Hunza glaciers

We are indebted also to Major Mason for a copy of a report on Hunza glaciers, made by Captain F. H. Bridges in 1908, which has remained unregarded in the records of the Political Officer at Gilgit for some twenty years. It

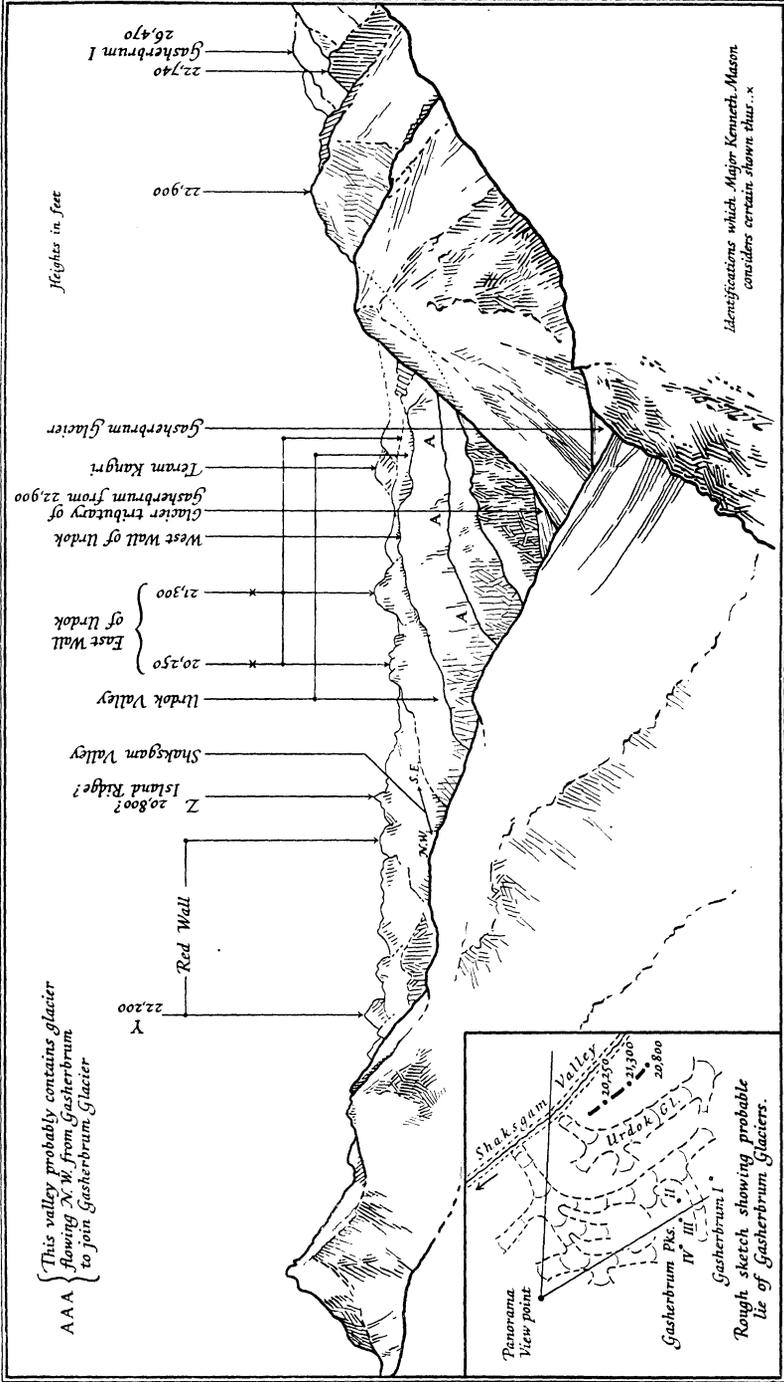
will be remembered that in 1892 Brig.-Gen. Sir George (then Lieutenant) Cockerill made a reconnaissance of the Shingshal Valley, with the particular object of reaching the Shingshal Pass from the west and joining up with the reconnaissance to this pass from the east made by Lieut. Younghusband in 1897. Four miles above the village of Shingshal he reported a large glacier which is the Yazghil, but for which he obtained the name Verigerab, and just below its snout he turned north-eastward up the nullah which comes down from the pass, leaving the upper part of the main valley unexplored. His report on this journey remained in the confidential records of the Political Department for thirty years, until in 1922 he obtained permission to publish the paper in the *Journal*, vol. 60, p. 97, Aug. 1922, calling attention to a most interesting region which had, it seemed, never been visited by any European since 1892.

When Mr. and Mrs. Visser planned their Karakoram expedition of 1925 they resolved to follow up this pioneer work of Lieut. Cockerill, and two marches beyond the village of Shingshal they "made the exciting discovery of an immense glacier region which was quite unknown." Three immense glaciers, the Virjerab, Khurdopin, and Yukshin-Gardan, were explored by them and mapped by Afraz Ghul Khan (*G. J.*, 68, 457, Dec. 1926); and Mr. Visser came to the conclusion that the floods which from time to time devastate the valley are caused by the Khurdopin advancing and blocking the valley.

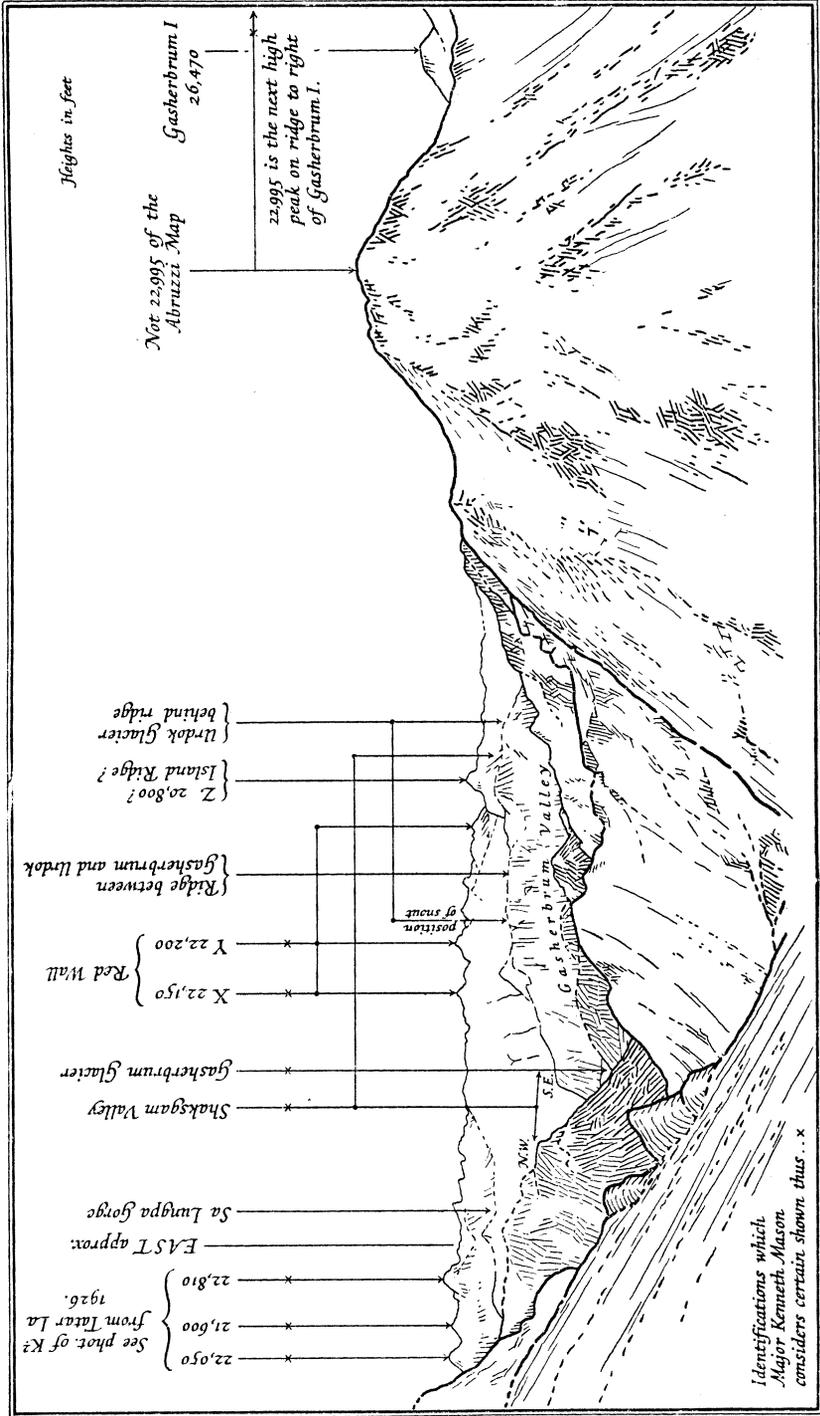
It now appears that this question had been investigated in 1908 by Captain F. H. Bridges and a little later by a surveyor detailed by the District Engineer. Thanks to the stimulus of the Himalayan Club the report has now been disinterred from the Gilgit records, and the greater part is printed below. The three glaciers which we first learned of from the Visser expedition are laid down on the sketch-map accompanying the report, and four sketches of the glaciers accompany it, of which copies are now in the Society's collection. Captain Bridges made no attempt to ascend the glaciers; his business was to study the cause of the occasional floods, and to provide for better future observation he established marks to serve as flood gauges, for the use of the watchers sent each summer by the Mir of Hunza. One may hope that some results came of this enterprise, and that further search in the Gilgit records, or inquiry of the Mir, may produce details of floods and heights of the temporary lakes.

Captain Bridges writes Yarsghil for Yazghil, Kurdarpin for Khurdopin, Vergerap for Virjerab, and Shungdickt (or Shungdiekt on the sketch-map) for Yukshin-Gardan of the surveys of Afraz Ghul Khan. His report for the region above Shingshal village is as follows:

On the 24th [April 1908] we moved camp up to the big glacier, which is about 8 miles from Shingshal. About 2 miles beyond the mouth of the Shugerab nullah is the Yarsghil Glacier, shown in error on the map as the Vergerap. This glacier is said to be about 8 miles long. It divides into two before reaching the river-bed, being split up by a hill in the mouth of the nullah. The two snouts of the glacier are about $\frac{3}{4}$ mile apart. The nullah-bed opposite the glacier is narrow, varying from about 10 yards to about 80 yards. Opposite the upper snout of the glacier is rock, from 100 feet to 200 feet high, and above that conglomerate pari. This snout is 48 yards from the opposite cliff. The snout of the lower half of the glacier is now only about 10



Panorama looking south and south-east from ridge east of Sella Pass, 20,000 ft. (De Filippi's Panorama F)



Panorama from southern ridge of Staircase Peak, 21,627 ft. (De Filippi's Panorama I)

yards from the hill opposite, which is conglomerate pari. The stream from the glacier is at present issuing from the upper snout.

It is difficult to gauge the amount of water now issuing from the glacier, as it issues in several streams; but the local men tell me all these streams are unfordable in the summer, so the amount of water must be considerable. The upper half of the glacier must be about 1000 yards wide, and the lower half about 500 yards; but in both cases the greater part is curved well back and has not advanced parallel with the snout. I placed three pillars at 50-foot interval in height opposite both snouts, and told the surveyor to put up a fourth both here and at Malunguti, so as to be able to register 200 feet. The lower snout of the glacier closed into the opposite bank last year; but the water ran all the time underneath. When the big glacier burst, it cut away the Yarsghil bund also. If the upper snout moves forward and piles up against the rocks opposite, a very serious bund will be formed and the nullah-bed between Yarsghil and the big glacier will be enclosed. The nullah-bed is about $1\frac{1}{4}$ miles long and 1 mile wide. It is dry at present, as the water from the nullahs above is running into the lake formed by the big glacier.

Above the Yarsghil glacier the valley opens out, and is about 1 mile broad for the next $1\frac{1}{2}$ miles, and then widens out to $1\frac{1}{2}$ to 2 miles across. About 5 miles above Yarsghil the valley divides into three nullahs: Vergerap, Khurdarpin, and Shungdickt.

Of these, Shungdickt is a small short nullah about a mile or two in length, while the other two extend for an unknown distance. At various times men have been sent by the Mir of Hunza to try and penetrate to their head; but have always returned unsuccessful. One levy, by name Murad Beg, who accompanied me, had been four marches into both of them during the time of Rajah Ghazan Khan. He said he could see no signs of the heads of the nullahs, and returned, as he had finished his rations.

The Khurdarpin and Shungdickt glaciers have swept down through their own nullah-beds, and meeting in the main nullah, have gradually moved on down till they now extend in one huge glacier, filling the entire main nullah-bed for a distance of about 2 miles below the mouth of the Vergerap nullah, and within about 16 miles of the upper snout of Yarsghil. The Vergerap Glacier, on the other hand, has remained stationary, and is still about 3 miles [1.6 miles according to the surveyor] away from the mouth of the Vergerap nullah. The united glaciers of Khurdarpin and Shungdickt, sweeping past the mouth of Vergerap, and impinging along the whole cliff face below Vergerap for about $1\frac{1}{2}$ miles, have enclosed a large open space at the mouth of the Vergerap nullah, and it is in this space that the lake gradually collects.

I went to the edge of the dam, overlooking the above space. It is difficult to estimate its size accurately, looking down on it like this; but, I should say roughly, it extends for 3 or 4 miles in length, and varies in width from 100 to 300 yards at its base, and would, of course, increase in width as the water rose. [The area enclosed extends from the dam up to the snout of the Vergerap Glacier (Survey Sheet, No. 3), length 2 miles, mean width 1 mile.—*Surveyor*.] At present there is water in it for about a mile in length; but it is impossible to make any accurate estimate of its depth. The local men estimate its present depth at the lower end at about 20 or 30 feet. Some of the Hunza men got

down by ropes to the lake to try and measure the depth; but had to abandon the attempt, owing to falling rocks and debris. [The depth measured at the upper end of the lake (see Survey Sheet, No. 3) was 25 feet. The ground has a fall of 2.6 feet per cent. The depth at the lower end of the lake would therefore be about 150 feet.—*Surveyor*.]

I could see the water-line of last year's flood on the rocks, and should say that the water did not reach a greater height than 200 feet, though this is a rough guess, as, without proper surveying instruments, it is impossible to make an accurate estimate. The surveyor, however, sent up by the D.E., will be able to do this. [According to mark pointed out by the local people, the water rose 140 feet above present water-level in the lake.] The water in the lake, I am told by the local men, stretched as far back as the snout of the Vergerap Glacier last year, and I could see the water-line on the rocks in the Vergerap nullah. The water, according to the reports of the men told off to watch it, rose last year till it overflowed the top of the glacier, where it impinges on the right bank, and then cuts its way clean through the glacier. This is undoubtedly true. There is an enormous channel, about 150 feet deep and 80 to 100 feet wide [mean width, 50 feet], cut clean through the ice, like a huge canal, at the lower end of the lake. This has water in it now. I went to the edge of it and looked down into it, and have told the surveyor to go to the same place and measure the depth of the water with a plumb line. This canal is closed by an ice-dam now, lower down. This dam is, I should say, roughly about $\frac{1}{2}$ a mile, or perhaps a little less, from the outlet from the lake. It is impossible to find out what is the nature of the glacier between this dam and the snout along the right bank. Last year's flood has broken up the glacier a good deal, and left enormous crevasses all along its right bank, and, consequently, it is impossible to reach this part. One of the Hunza men managed with difficulty to reach a spot from which he could see the dam blocking the canal, but could get no farther. From questioning him, I should say it was about 100 feet above the present water-level. The water breaking through last year has caused the whole of the glacier on the right bank to sink a good deal. The centre has remained much higher, but both on the right and left banks of the nullah the glacier is at a much lower level. I examined the snout of the glacier where it impinges on the right bank, and found no sign of an outlet. There was a perpendicular wall of ice with no apparent fissures about 100 or 150 feet from the nullah-bed across last year's outlet, which is now closed. The distance between the snout near the right bank and the ice-dam in the canal is, I should think, roughly about $\frac{3}{4}$ of a mile. My camp was in the nullah within 200 yards of the snout of the glacier. My aneroid showed a rise of 800 feet from my camp to the highest point in the centre of the glacier between my camp and the lake. The distance from my camp to the lake was, I should say, about 2 miles.

Unless the glacier moves forward again and, piling up against the hill, closes last year's channel, I should say that the lake will not rise as high as it did last year, as all the local men agree that last year's bund was a good deal higher. There is, on the other hand, the danger of the bund this year suddenly bursting, when the lake is full, instead of the water gradually cutting a way as it did last year. The water last year from the lake took eleven days to empty; hence the small rise of water. I placed three pillars of stones in a line, close to the present

canal, so that the surveyor, while working there, can watch them, and see if the glacier is closing in on the canal. The local men tell me that the channel is narrower now than it was after the flood last year. Water from all three nullahs frequently empties into the lake, according to the local men. At present there is water from both the Vergerap and Khurdarpin nullahs running into the lake. Water from these nullahs runs all the year round; but in the winter the streams are small. In the summer the Vergerap stream, I am told, is bigger than the Shingshal River between Passu and Dikat, which means a considerable volume of water, as the latter is unfordable in summer and even now is $3\frac{1}{2}$ feet deep in places, and about 8 yards wide. In the big flood three years ago, the flood took much the same course as it did last year; but the bund was higher then.

In the flood that took place about four years ago, which destroyed a great deal of the Shingshal cultivation, the flood came down the left bank of the nullah, having worked its way under the glacier. The second flood which came down last year in September was caused by the Malunguti Glacier blocking the stream, and not by the Khurdarpin lake at all, which at that time was empty.

At present there is no water issuing from the glacier, except a few small streams caused by thawing on the surface. I think the lake ought certainly to be watched again this year. Information should also be sent at once to the D.E. if either the Yarsghil or Malunguti Glaciers block the nullah, and a lake forms behind them.

I was accompanied the whole way by Wazir Humayun of Hunza, who made the most excellent arrangements for me. I was shown all the arrangements which were made last year to give information to Baltit when the flood was coming. Great trouble appears to have been taken over this by Wazir Humayun and the Shingshal people. There were thirty-one different posts of three men each out on the hilltops, day and night, for twenty-three days. The arrangements were that, if the flood came at night, beacon-fires were to be lit, and if it came by day, shots were to be fired.

In case the D.E. wishes to ask any questions at any time from local men, I would recommend Levy Murad Beg of Shingshal being sent for, who has watched the glacier for years. The arrangements last year were made by Trungfa Kalandari of Hyderabad, who was specially deputed for this work.

On the march back, a good deal of difficulty was experienced at two of the fords, between Dikat and Passu, on April 29, as the river had risen and was $3\frac{1}{2}$ feet deep, with a very strong current. The coolies, however, managed to get across with the aid of ropes, and there were no accidents, though a certain amount of the baggage got very wet.

I did not have any difficult work climbing, the fords being the only difficulty on the road. Wazir Humayan tells me that once the river between Passu and Dikat has become unfordable there is no possible way down this part of the valley, even for the local men, and they have to go round over the Karan Pir to Gircha.