

1/100,000 map, again points to the 22 m. not the 28 m. level as representing the longest pause.

Apart from the fact that we found in the north Mousterian implements associated with beaches at a low level, from the geological point of view I would suggest that the interval between the end of the Palaeolithic (indicated by the 22 m. level according to Messrs. Sandford and Arkell) and the beginning of the Neolithic—dated by Miss Caton-Thompson to about 6000 B.C.—is extremely short for the work accomplished, which consisted in (1) the cutting of the Nile Valley from 22 m. to below sea-level, presumably to at least —50 m. (164 feet), since the Faiyum “tributary” must have graded into the Nile; (2) the filling of this great trench with alluvium, and the formation of the Neolithic lake in the Faiyum; (3) the isolation of this lake by the silting up of the Hauwaret Channel when the 18 m. (59 feet) level had been reached, and its fall to about 10 m. (33 feet) before the advent of the Neolithic people. All this would have to be accomplished in a time of increasing desiccation, which would not hasten either the degrading or aggrading processes.

For all the above reasons Miss Caton-Thompson and I would regard the later stages of the 22 m. lake as Middle Palaeolithic in age, and are led to take a fundamentally different view of the course of events in the later history of the Faiyum Oasis.

While recognizing the value of Messrs. Sandford's and Arkell's contribution to the subject, we could have wished that their statements on such questions of widespread interest as Palaeolithic climates, etc., had been supported by at least an outline of the evidence on which they were based, and we look forward with much interest to the publication of the facts on which such a fundamentally new view of the origin of the Faiyum has been framed.

THE GLACIERS OF THE UPPER SHYOK IN 1928

CAPTAIN MALCOLM C. SINCLAIR

IN the autumn of 1926 a very large flood suddenly swept down the Shyok Valley, carrying away the suspension bridge at Satti just above the Shyok-Nubra confluence, and doing great damage both at the actual confluence, where the waters backed up the Nubra for 8 or 10 miles, and also downstream. The bridge at Satti was a link of very great importance on the Central Asian Trade Route, which was established as the result of the Treaty of 1870 with the Maharajah of Kashmir. The Shyok at Satti is a deep and fairly swift river, and some idea of the magnitude of this flood can be obtained from the fact that even though the river-bed at this point is about 1000 yards in width the water rose to a point about 30 feet higher than the highest normal summer flood-level.

The cause of this flood was more or less definitely known to be the bursting of a glacial dam in the upper courses of the Shyok, but the extent of the lake so formed was unknown, and it was not even certain which glacier had caused the actual stoppage. During the late spring of 1927 reports from Saser

Brangsa, where the trade route again crosses the Shyok, showed that a fresh stoppage had occurred above the ford, and a sub-overseer of the Kashmir Engineering Department was deputed to visit the spot. His report showed that the stoppage was due to the advance of the Chong Kumdun glacier, the most northerly of four glaciers which lie to the north of Saser Brangsa. He stated—I write from memory—that the dam was 300 yards long, 400 yards wide, and about 450 feet high. The length of the resultant lake he put at about 4 miles, with an average width of 300 yards.

Formerly the trade route followed the Shyok valley north of Saser Brangsa as far as Yapchan, and then east-north-east across the Depsang plains to the Karakoram Pass. Owing to the frequent advance of those glaciers to the north of Saser Brangsa and consequent stoppages, this route fell into disuse, and caravans now travel via Murgo and Kizil Lunga. This route, though longer, is free of snow and offers no difficulties other than the utterly barren nature of the country. It will therefore easily be understood that reports as to the state of affairs on the Upper Shyok were rare and unreliable. As the Kashmir authorities were naturally opposed to the idea of rebuilding the bridge at Satti in case of a repetition of the events of 1926, I, as British Joint Commissioner, decided to visit the site of the lake and dam, and collect information.

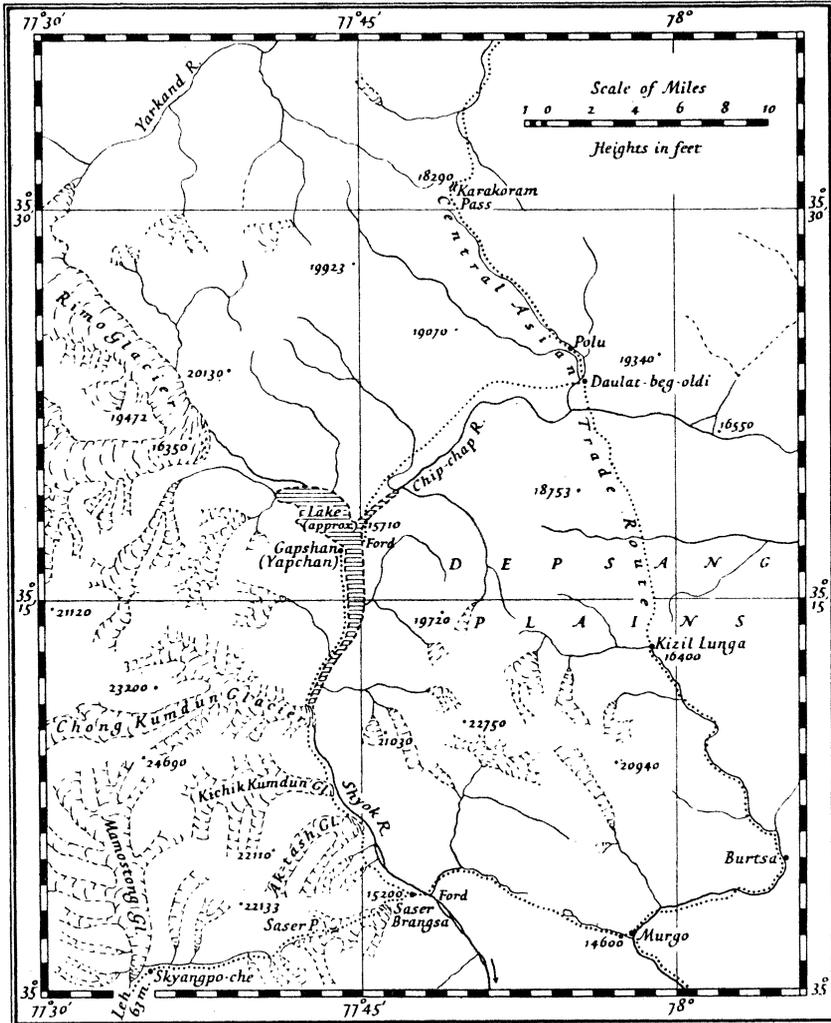
The expedition left Leh on 5 July 1928 and proceeded via the Khardung and Saser passes as far as Daulat-beg-oldi on the Depsang plains, and thence west to Yapchan. This detour on the Depsang plains was made in the hope of securing a Tibetan Antelope head, but in spite of an abundance of does and fawns not a single male was seen. A wild yak was seen on the foothills above Yapchan, which was reached on July 18. The Ladakhi pony-men stated that formerly yak abounded near the Rimo glacier, but none had been seen in that neighbourhood for years.

As soon as the expedition arrived near Yapchan it became obvious that the lake was very much larger than any of the reports had indicated. Observations showed that its level was rising rapidly, and the average daily rise during the three days' halt at the lake proved to be 27 inches. This rise appeared constant, and there was no noticeable variation between the rate of rise by day or night. During these three days a rough survey was carried out of the lake, which proved to be about 8 miles long, wide at the northern end and narrowing rapidly at the south, the average width being estimated at about 1000 yards. No boat was available, and though an attempt was made to obtain soundings from a skin raft, weather conditions made such navigation too dangerous, and it was only possible to obtain one set of soundings at a point about halfway up the lake, which gave a maximum depth of 80 feet in that section.

Traces of four different flood-levels were clearly marked along the eastern shore of the lake. The lowest, presumably that of the 1926 flood, was 4 feet above lake-level on the evening of July 19, the others being 18 feet 6 inches, 47 feet, and 63 feet above lake-level.

It was not found possible to reach the dam from the north, and accordingly the main camp was moved back to Saser Brangsa, and a very light camp sent up by coolies along the river-bed to a point on the west bank of the Shyok about half a mile below the dam, where a fair camping-ground exists. We ourselves

kept considerably higher, crossing both the Ak-tash and the Kichik Kumdun. It is known that both these glaciers have blocked the river-bed at intervals even in the last twenty years, but so far as is known the river has always eaten its way through, and no lake has been formed. Our observations showed that the



The glaciers of the Upper Shyok and the trade routes to Central Asia

Ak-tash was well across the river-bed and was still advancing; the Kichik Kumdun, on the other hand, was in retreat, and its snout shows signs of having suffered considerably during the 1926 flood. Personally I doubt whether the fourth and most southern glacier has been across the river for very many years; at any rate it is now about 3 miles away. Unfortunately the effect of the 1926 flood on the Chong Kumdun is not known. This flood took place unusually

late in the year (October 21), and no one ever saw the site until the glacier was again right across the river-bed in the spring of 1927.

Weather during the three days spent at the dam was extremely bad, and snow fell practically continuously. Partly for this reason, and partly through the lack of any climbing equipment, it was not found possible to cross the dam, and in consequence we were unable to obtain any soundings near it, and such observations as we were able to make were very general. The river valley north of the dam runs north-east, and the Chong Kumdun comes in from the north-west, the valley south of this point being about 600 yards wide, and to the north little more than half this width. The glacier at the point where it enters the river valley is about 400 yards wide, with very steep slopes on both sides; farther to the north-west there appeared to be a considerable basin, but the visibility was very poor. The actual dam was 330 yards long and 400 yards wide, with a minimum height of from 400 to 450 feet. The glacier abutted on a precipitous face of red sandstone, and at this point was at its lowest in a small dip about 20 yards wide and 40 feet deep. The level of the lake appeared to be about 70 feet below this point. Probably the reason for the existence of this dip was the radiation of heat from the rock face which catches the sun throughout the greater part of the day. There were no signs of percolation near the actual dam; a small stream flowed from the eastern corner, but this was almost certainly due to melting. About 600 or 800 yards downstream there were, however, some very strong springs which presumably owe their origin to the lake above.

It is not known whether the lake-level ever reached the top of the dam last year. The winter of 1928 set in unusually early in Ladakh, and it is possible that it did not. Another expedition consisting of an officer from the Punjab Irrigation Department and Mr. F. Ludlow are at the time of writing *en route* to the site of the lake, and as they have boats and proper climbing equipment, should have little difficulty in making a detailed survey of the lake and dam if it still exists.

The above account may be usefully compared with Mr. F. Ludlow's narrative in the first number of the *Himalayan Journal* of his visit to the Shyok dam only about a fortnight later. Mr. Ludlow had originally planned a visit to the Karakoram Pass, but when public interest in the condition of the dam became great, he decided to make a detour to the Upper Shyok valley. He was able to make no accurate survey, but his observations, mainly based on rough estimates, are interesting for the sake of comparison, as his visit followed so closely on that of Captain Sinclair.

Leaving Panamik in the Nubra Valley on July 24, Mr. Ludlow travelled by the trade route over the Depsang plains to Daulat-beg-oldi, which he reached on July 30. Descending the Chip-chap river next day, he encamped on the eastern shore of the Gapshan lake, a little north of the Chip-chap confluence. He estimates that the lake, which narrowed southwards to a breadth of only a few hundred yards, was then $1\frac{1}{2}$ to 2 miles across at its widest part. The length he thought to be about 10 miles, and the average depth, by a rough calculation based on a 30-feet-per-mile fall in the river Shyok, about 150 feet. Like Captain Sinclair, he noticed terraces, indicating former lake-levels, on

the eastern shore, though he does not specify their number. Further, he states that one such terrace was then about 100 feet above the surface of the lake. The highest of the four terraces mentioned by Captain Sinclair was estimated to be 63 feet above the water on July 19.

Mr. Ludlow also comments on the rapid rise of the lake during his stay of two days, but the rate, according to his calculation for August 2, was then 18 inches in 24 hours, as compared with Captain Sinclair's estimate a fortnight earlier of 27 inches a day on a three-day average. It will be seen that snow fell practically continuously during Captain Sinclair's visit, and that there appeared to be no noticeable variation in the rate of the rise of the water between day and night. During the two days that Mr. Ludlow was there, on the other hand, the weather was particularly warm and sunny, so that the glaciers feeding the lake, he believes, were probably melting at their maximum rate. He suggests that on a cold cloudy day the rise observed on August 2 might have been halved or quartered.

Mr. Ludlow tried to make his way to the dam round the north and west shores of the lake, across the snout of the central and southern Rimo glaciers, which was about 7 miles from the Chip-chap confluence. The route to the snout, though crossed by a number of ravines, was not difficult, but seracs over 100 feet high at the snout made further progress impossible. The streams below the glacier also were too deep to ford. He therefore abandoned the attempt, and, after visiting the Karakoram Pass, returned via the trade route to Saser Brangsa, resolved to ascend to the dam from there.

On August 9 he started on foot up the valley with one Ladakhi pony-man and his Kashmiri tiffin coolie. He first encountered the Ak-tash glacier. It is particularly interesting to compare the accounts of this glacier given by the two observers. Mr. Ludlow states that its ice-pinnacles were for the most part 200 yards from the Shyok bed, and that only in one place did they actually reach the right bank. Further, he states that the glacier was in retreat. The Kichik Kumdun, which he reached next, appeared from a distance to descend and stretch right across the Shyok to cliffs on the left bank. When, however, the glacier was crossed, the tongue was found to terminate some 80 yards from the left bank of the Shyok.

Following the river, the party reached the north lateral moraine of the Kichik Kumdun, and from there saw the great dam about 2 miles ahead. They continued to within about half a mile of it, when, finding themselves in a cul-de-sac, they had to abandon the attempt to reach the dam, as it was then late in the afternoon and they had made no provision for a night in the open. Mr. Ludlow's study of the dam was therefore unfortunately limited to observation through glasses from the south, at a range of half a mile. So far as he could see from this distance, the Chong Kumdun glacier appeared to have turned down the Shyok river-bed for from 500 to 600 yards. The length of the dam he estimated at between 350 and 400 yards, and the height 200 feet at the snout, whence it rose steeply towards the lake behind. He remarked that the weakest part of the dam appeared to be that immediately adjoining the left bank, the point where Captain Sinclair had found it to be lowest. Like Captain Sinclair, also, Mr. Ludlow considers that there was little percolation from the lake through the glacier, the water issuing from the snout appearing to be mainly due to the melting of the glacier itself.

A number of villagers insisted that this calamity of a change of course and the birth of a new river was due to canals being cut to irrigate the grazing-grounds north of the Chong Köl, and the villagers wished to revenge themselves on the big "bais" who had done so. This explanation, however, can carry no weight. The situation seems to be that there has been an accumulation of water in the area south-west of Kurla which is now (November 1928) quite impassable except by boat. The channel of the Yarkand River has, in course of time, become choked. There is thus a barrier of sand which has diverted the drainage of the Chong Köl farther east. This immense flow of water, meeting the Konche Darya, has taken along with it most of the water of that river. The result of this is that the Konche Darya below its junction with the Chong Köl water only receives some surplus water, just as the Yarkand Darya does. The surplus water occurs in October and is due to the irrigation water being turned off the land at the end of the season in the areas north and west of Chong Köl. What is remarkable, however, is that the Chong Köl water should have gone beyond the Konche Darya. It would seem more natural to combine with the latter river, and make a larger channel of the already existing one. The end of the Yangi or Qum Darya is said to be a large swamp west and north-west of the Loulan area, so that the ancient site is now only accessible from the east and south, *i.e.* from the Lop Nor direction.

This account may seem fantastic to those accustomed to rivers flowing in regular beds, with perhaps a rare and local divergence of a few yards. As a matter of fact, there is nothing unnatural about what has occurred. The rivers that drain into the area between the Tien Shan and the Kunlun pour themselves into a vast plain of sand, broken only by dunes or ridges themselves the result of fluvial action, or by equally unstable undulations produced by the wind. There is really nothing to control the course of a river once it has entered on this welter of sand. The channel that it carves for itself cannot, from its nature, have any permanence. Indeed, it is rather a source of wonder that there are not more changes in the beds of the rivers which discharge their vast volume of water into the fickle sands of the Taklamakan desert.

THE DUKE OF SPOLETO'S EXPEDITION TO THE KARAKORAM

Communicated by Major Kenneth Mason, Survey of India

NEWS has been received from Kashmir of the return of the Duke of Spoleto's Italian expedition from the Karakoram. The party was organized as follows: H.R.H. the Duke of Spoleto (leader), Commander Mario Cugia (second in command), Signor U. Balestreri (in charge of climbing and caravan), Colonel Gino Allegri (doctor), G. Chiardola (topographer), Professors V. Ponti, A. Desio, L. Di Caporiacco. There were also a cinematographer, a wireless operator, and two experienced Courmayeur guides, Evaristo Croux and Leone Bron. The expedition arrived in India in February and March, and left Srinagar in three parties on March 27 and 30 and April 3.