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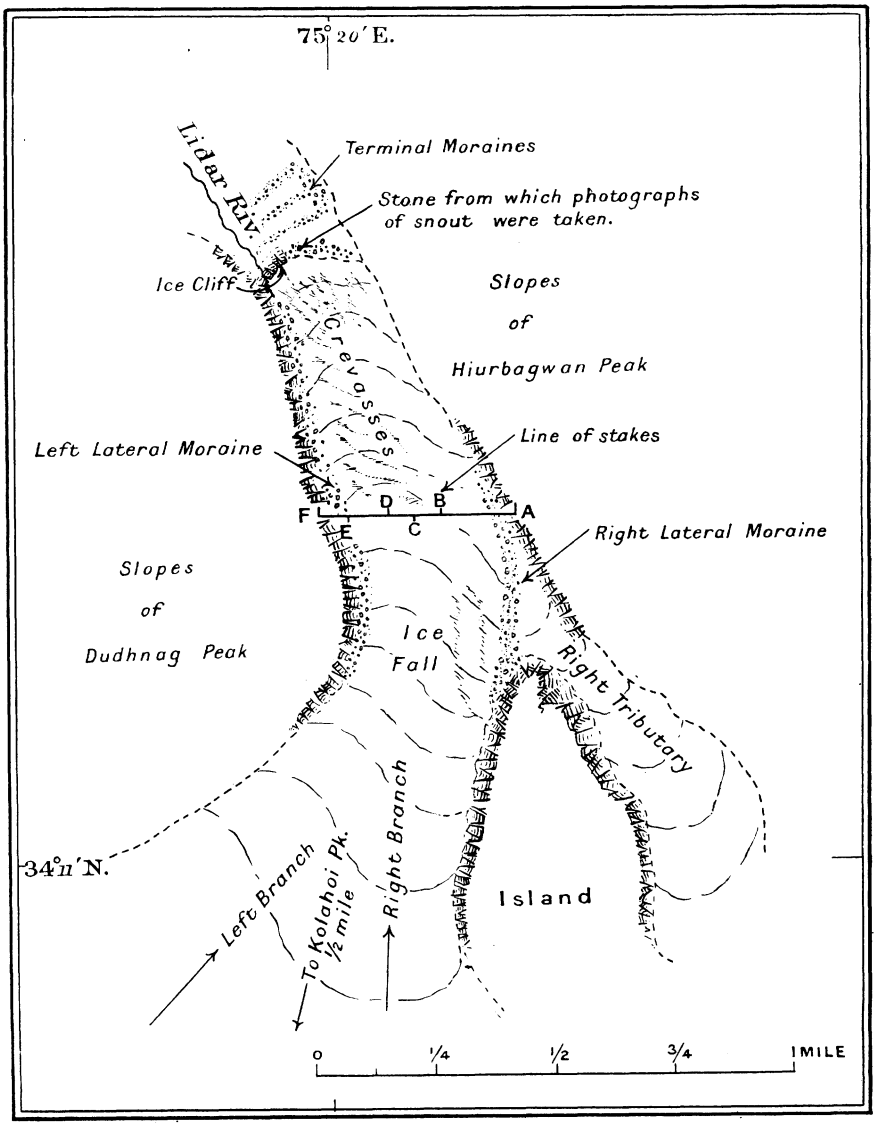
Athens, 1925.

THE MOVEMENTS OF INDIAN GLACIERS

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

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



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

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

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

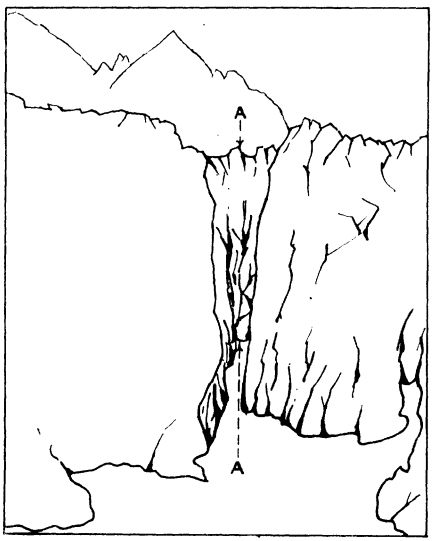
Sergt. Coleman has therefore carried out a commendable piece of work, and it is to be hoped that his example will be followed by others. The value of such observations in the Himalayas has long been appreciated. In 1905 Mr. D. W. Freshfield, on behalf of the Commission International des Glaciers, brought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

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

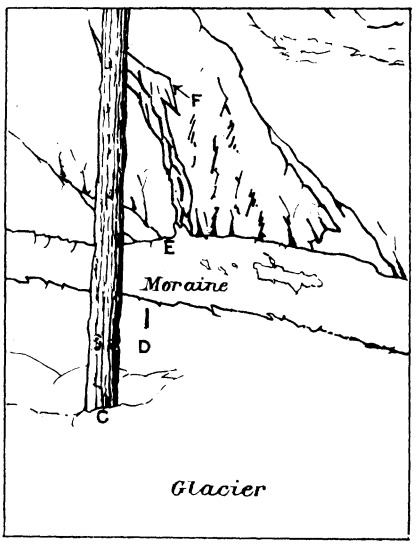
In Lahaul Messrs. H. Walker and E. H. Pascoe examined and marked two glaciers, Bara Shigri and Sonapani. Both showed signs of retreat. The

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

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



Mark A on right of Glacier.



Marks C, D, E, and F.

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

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