

moving deserts of sand, and strange stone-figures rising from the black and glistening lava-flows, could not fail to be invested with many curious stories, and be, to the Maori, places which should be approached with the utmost caution or altogether shunned."

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### DR. LONGSTAFF'S HIMALAYAN EXPEDITION.

THE *Times of India* of September 2 contains a long and detailed account of the first portion of Dr. Longstaff's latest expedition by Dr. Arthur Neve, one of the members of the expedition. Dr. Neve points out that up to this year no expedition had crossed the main axis of elevation of the Mustagh and Karakoram range between the Mustagh pass on the west and the bridle path over the Karakoram range on the east, a distance of 90 miles, within which not a single pass was known. Sir Francis Younghusband, while exploring the upper valley of the Yarkand river, had discovered the western Aghil range, between which and the Mustagh lay the Oprang valley, with its great glaciers from the northern slopes of Gasherbrum and  $K_2$ ; but though he had penetrated to the head of the valley, and found a saddle-shaped depression, he had been obliged to turn back without elucidating the problem of the passes leading into Kashmir. On Dr. Longstaff's arrival at Srinagar this year Sir Francis Younghusband placed at his disposal the detailed notes of the survey of the Oprang valley. An examination of these, Dr. Neve says, showed that the cartographers had taken considerable liberties with the observations in order to fit them in with the preconceived ideas of the Survey department. An interesting clue for the fixing of the peaks sighted by Sir Francis Younghusband was furnished by the Duke of the Abruzzi, who in conversation with Sir Francis pointed out the extraordinary similarity in outline between a sketch of Gasherbrum drawn by A. D. McCormick from the south and the sketch of a peak drawn by Sir Francis Younghusband from the north. On the assumption that this suggested identification is correct, the saddle and pass seen by Sir Francis Younghusband lie to the north-west of the position hitherto assigned to them, and there is—or was before Dr. Longstaff's expedition—left on the map a blank space representing a considerable area north of lat.  $35^{\circ} 30' N.$ , in the neighbourhood of long.  $77^{\circ} E.$

The expedition left Srinagar at the end of May. It included, besides Dr. Longstaff and Dr. Neve, Lieut. A. M. Slingsby of the Frontier Force. Khapalu was reached by way of the Zogi and Gantse passes, though locally the latter pass was not supposed to be open until much later in the season. From Khapalu the expedition crossed the Shayok river into the Hushe valley, whence a low pass led into the Saltoro valley. The scenery shows upon the grandest scale, says Dr. Neve, the typical conditions of Baltistan. The river-bed is wide and sandy, shut in by cliffs, and at the opening of each side ravine there is a fan-shaped talus richly cultivated and terraced, well irrigated, and bearing crops of wheat and barley almost hidden by dense masses of apricot trees, with here and there walnuts or poplars. The huts are of stone, clustered thickly on any stony knoll or old moraine. Some of the huts have a light upper story of lath and plaster for summer use. Towering about the huts rise gigantic walls of granite to peaks 21,000 feet high, presenting the steepest and smoothest precipice-faces Dr. Neve has ever seen.

The final arrangements for the exploration of the Saltoro or Bilaphond glacier were made at Guma, in the upper Saltoro valley. Starting up the Bilaphond valley, the explorers soon came in sight of the great main glacier, and established a base camp in a lovely grassy glade, among willow trees and rose bushes, with some

big rocks and caves in which the porters found ample accommodation. The Balti porters knew the place well, as it is a favourite grazing-ground, and they informed the explorers that during the last twenty years or so the glacier had advanced about a quarter of a mile. During a reconnoitring expedition on the following day a view was obtained of a lofty snow-peak, almost due east, which was identified as  $K_{12}$ ; but there was considerable doubt about the identification of this and all other peaks, as the explorers had reached a point where the maps were quite unreliable. Ascending the glacier, the expedition encamped at a height of about 17,000 feet, near to some ancient stone-shelters, of which even the Baltis were without knowledge. The shelters were roofless, and in their best days could not have been more than about 4 feet high, but they indicated that the pass was known and used in former days. Early next morning the explorers continued up the easy snow-slopes which led due north to a wide saddle some 1500 feet above the camp. They reached the top in three hours, and there they found themselves on a snow-plateau of great extent, sloping up west to the outlying peaks of  $K_{10}$ , and east up a shallow valley to the snow-ridge going north from  $K_{12}$ . In front, perhaps 15 miles to the north, was a lofty, dazzling snowy range, evidently the Aghils. Progress across the plateau was delayed by the soft condition of the snow, and Dr. Neve says that great credit is due to the porters, who neither grumbled nor despaired. After a night on the snow-field, the journey was continued to the very large glacier in front. Dr. Neve says that he has seen the Hispar glacier and the Chogo Lungma, but none which has made on him such an impression of size as the one that then lay before them. According to the Baltis, the country to the north is called Terim, and that name was therefore given to the glacier. It appeared to originate near Gasherbrum peak, which could be seen some 25 miles to the north-west; and in the same direction, only a little more to the right, was a depression which appeared to correspond with the saddle seen by Sir Francis Younghusband; over it a pass could probably be made to the Oprang valley.

Dr. Neve reports that the Terim valley is evidently tectonic, with granite to the south and limestone and slate to the north. Its upper part averages 4 miles in width between the spurs. In its size and stratigraphical relations it is analogous to the valley of the Baltoro glacier on the Indian side of the watershed. Lessening supplies and the fear that the pass would become blocked with snow obliged the explorers to retrace their steps without following the glacier to its termination, and when, after the return to the expedition's base, Dr. Longstaff came to work out his map, it was realized that further exploration would be necessary to settle the question of the connections of the Terim glacier. Does the Terim, asks Dr. Neve, belong to Chinese Turkestan or to British India? When on the glacier, the explorers had assumed that it must flow to join the Yarkand river, of which it would undoubtedly be the longest and largest tributary. But when the map was worked out, the question arose whether the glacier might not turn south and flow down to the upper Nubra.

It was to find the answer to this question that Dr. Longstaff afterwards proceeded to Nubra. A telegram has been received from Dr. Longstaff from Leh, stating that he has connected the Terim\* with the Saichar glacier, at the head of the Nubra valley, making it 50 miles long. It would seem, therefore, that the Terim lies on the Indian side of the watershed.

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\* In view of Dr. Neve's article, it is obvious that Dr. Longstaff's telegram has no reference to the Tarim, or lower Yarkand, river of Chinese Turkestan.

a brief account of the lives and works of those two historians. The translation has evidently been made with great care, and, supplemented as it is by abundant and valuable notes, it cannot fail to be of much service to English readers desirous of studying these standard authorities for the connection of the Portuguese with Ceylon.

#### THE HIMALAYAS.

'A Sketch of the Geography and Geology of the Himalaya Mountains and Tibet.'  
By Colonel S. G. Burrard, R.E., F.R.S., and H. H. Hayden, B.E., F.G.S. Part IV.  
'The Geology of the Himalaya.' Price Rs.2.

This paper forms the fourth and concluding part of the work on the geography and geology of the Himalayan area, of which the first three parts were noticed in the *Journal* for October, 1908. The geology of the region has been dealt with by Mr. H. H. Hayden, of the Geological Survey of India. Mr. Hayden is particularly qualified to write on this subject. He possesses unrivalled knowledge of the area under discussion, and is, perhaps, the most experienced trans-frontier geologist living. Not only has he worked extensively in Kashmir, Spiti, Ladakh, and the high regions north of Kashmir, and in Western Tibet, but he accompanied, in the capacity of geologist, the Tirah expedition of 1897-98, and the Tibet Mission in 1903-04. Added to this, he spent some two years attached to the Court of Kabul, where he had opportunities for travelling in Afghanistan which have been accorded to few others. With all this accumulated experience, no better officer could have been selected for the difficult task of writing a summary of all that is known of the geology of the Himalaya. The value of his work is further enhanced by the clear and lucid style in which he writes; indeed, this feature is characteristic of the whole series of papers.

The author divides the Himalayan system, for geological treatment, into three zones. The sub-Himalayan Zone, on the south side (embracing the comparatively low foothills), which occupies a belt extending throughout the whole length of the Himalaya. It is composed, for the most part, of rocks belonging to the Tertiary age. Inside this, and more or less parallel to it, lies the Himalayan Zone, comprising the Lesser Himalaya and the high central peaks "composed of granite and other crystalline rocks, and a great group of unfossiliferous sediments of unknown age." Lastly, the Tibetan Zone, lying north of the line of the high peaks, constituting "a series of highly fossiliferous sediments ranging in age from the Cambrian to the Tertiary periods." This system of division forms a basis on which to build the details of the geological structure, into which it would be impossible to enter here.

There is always a certain fascination connected with speculation as to the past, just as there is when we attempt to dip "into the future far as human eye can see." In this work Mr. Hayden endeavours, from geological evidence, to reconstruct the ancient topography of the Indian area, and to indicate the relative distribution of land and sea at the various stages of past history. On p. 257 we find an admirable summary of the conditions which prevailed during the various periods. In the Purana era—the earliest that can be traced from geological records, and of pre-Cambrian age—the Indian Peninsula and the Himalayan area were sunk beneath a great sea, which may have extended to China. At the close of this era there is evidence of volcanic activity, and a glacial epoch. In the Dravidian era occurred the "emergence, and conversion into dry land, of Peninsular India and the southern part of the Himalayan area." In the last, or Aryan era, there was an extension of continental conditions in the Himalayan area. What are now the northern slopes of the Himalaya became the southern shores of the Tethys sea,