

formed a part of one great demonstration of the development of life. So was it with the physical world, which no doubt began before there was any life upon it. The rocky life of the world, like the animal life, had been going through successive phases, and at length the present temporary conditions had been developed. This was an epitome of the general tendency of the subject, of which Mr. Geikie had given so admirable a sketch in his lecture.

Explorations in Western Tibet, by the Trans-Himalayan parties of the Indian Trigonometrical Survey.

THE 'Report on the Survey of India for 1877-78,' a few copies of which have just reached this country, contains a very interesting Report on the Trans-Himalayan operations (trigonometrical), conducted under Mr. E. C. Ryall, in Hundes, a district in the western part of Chinese Tibet, and adjoining tracts.

This officer had been engaged in triangulating, in connection with the Kumáon and Garhwál Survey, for some few seasons past, and this work has led him in several instances to extend his operations across the frontier into Chinese territory, with which the British possessions are here conterminous. In 1877, the Surveyor-General directed Mr. Ryall to continue the Milam Valley series up to the frontier of Hundes, or Nari-Khorsam (the name applied to that portion of the Upper Sutlej or Karnali basins which is under the Government of China), and from thence to lay down some of the distant peaks in Chinese Tibet. This Mr. Ryall successfully accomplished, and the number of triangles measured by him were thirty-eight in number, exceeding 100 miles in length.

At first the mountains encountered were of an average height of 9700 feet, well wooded, and not over rugged, their slopes being studded with numerous villages and extensive patches of cultivation. On Mr. Ryall's arrival at the loftier stations, the inclemency of the weather and the very great depth of fresh snow, covering the mountains down to their very bases, were such that he anticipated his further progress would escape the knowledge of the Chinese officials, owing to the deserted state of the passes at that early season. After five days' cutting through the snow, Mr. Ryall succeeded in crossing over into Hundes on the 8th June. By that time his arrival became known to the Chinese officials, but by informing them that his object was simply to survey the northern limits of British territory, which he found it impossible to do from the southern faces, he succeeded in satisfying them and in obtaining permission to remain. With great despatch (for the monsoons were fast approaching), he fixed the most prominent points, which included the snowy peaks across the Sutlej and at the head of the Manasarowar lakes, and others lying at the head of the Darma and Byans Valley, as well as the well-determined peaks in Kumáon and Garhwál, as a check on the new work. The remarkable peak Leo Pargial (of which a striking

description is given by Mr. Andrew Wilson in his 'Abode of Snow') was fixed, and differed in position but very slightly from previous measurements. From the Hundes station thirty-eight peaks were laid down across the Sutlej. The most remarkable of these is Gurla Mandhata, a name of Indian origin, the legends of the Milam Bhotias being to the effect that the great mountain is the transformation of the body of a raja of Benares called Mandhata, who is said to have died some thousands of years ago on the shores of the Manasarowar Lake, while on a holy pilgrimage to its waters. Gurla Mandhata attains an elevation of 25,360 feet, while between it and Kailas (another well-known peak), lie the celebrated lakes of Manasarowar, Cho Mapang, and Lang Cho. Kailas, though inferior in height to the former peak, is very striking in its appearance. It is not unlike a roughly made Hindu or Pandu temple, with a few feet of its conical top broken off. This has led to its being invested by the Hindus of Northern India with a sacred character, which is enhanced by its immense bulk and height, towering as it does full 2000 feet above its compeers for 40 miles round. Excepting Nanga Parbat it is probably the most conspicuous and impressive sight in the whole Himalayas. Mr. Ryall states that his triangulation of Hundes has been so far extended as to supply good bases for a detail survey, if it ever be desirable to have one.

Hundes or Nari-Khorsam is divided into three districts, viz. Tsaparang, Daba, and Purang, all under the governorship of the Garpan of Gartok, whose authority extends also over the district of Rudok, which together with that of Gartok comprise the country called Monyul. Mr. Ryall states that, as a rule, for about 6 miles after leaving the watershed line on the frontier, one finds oneself hemmed in by steep though not rugged spurs, which suddenly merge into almost absolute plains, sloping gently to within a few miles of the Sutlej, where they break up into narrow spurs or ribs separating deep ravines. The cliffs overhanging the Sutlej exceed 2000 feet a few miles below Dongpu. The mountains on the north of the Sutlej are rounded and undulating, with groups of tiny peaks cropping up here and there. The average height of this range of mountains (which has no general name) is not more than 2500 feet above the general level of the plateau. To all appearance these mountains might be crossed anywhere, some of the passes over the water-parting having an almost imperceptible rise. Judging from the fact that the fall of snow in the early part of 1877 was exceptionally great, Mr. Ryall concludes that the snow-line is rarely under 20,000 feet in any part of Hundes.

From a central position the view presented by the whole of the Hundes Valley was that of an extensive plain, interrupted here and there by a few groups of isolated low ridges, lying principally east of the valley, and west of the Manasarowar lakes. The poplar is cultivated along the lower banks of large streams, but beyond this there are

absolutely no trees indigenous to this desolate country. The plains, the low ridges on them, and the mountains separating these from the British dominions, are chiefly composed of clay, slate, and fossiliferous limestone.

The houses in Tsaparang and Daba (the chief towns in their districts) are built like those in Ladakh, of uncut stones and clay cement, roofed with beams and rafters of poplar wood, the walls being plastered over with white clay. Each of these towns contains a small armed mounted police, who assist in levying duties on merchandise. Taklakhar, the chief town in Purang, is a military outpost containing a garrison of about 100 men, situated on the right of the Map-chu, or *Big River*, known as the Karnali in the Ghorka territories, and to the north of a small stream coming down from the Byans Pass. The fort consists of a series of excavations, in a huge mound rising abruptly to a height of about 800 feet. Store-rooms are situated on the top of these excavations, and contain immense stores of grain and ammunition. Some quantities of grain are said to be no less than fifty years old, the extreme dryness of the atmosphere allowing cereals to be kept almost any time without deterioration. Taklakhar is the last or furthestmost post occupied by the Dogras during their brief invasion in 1841, under Zorawar Sing, a graphic account of which is given in Cunningham's 'Ladak.' West of Taklakhar Fort is Sibling Gonpa, the largest monastery in Nari-Khorsam, maintaining 310 lamas, and a great accumulation of wealth.

The people of Hundes are called Hunias by the inhabitants of the higher valleys in British territory adjoining. They are of Tartar origin, and have the leading ethnological characteristics of that race, high cheek bones, flat noses, broad at the base, rather full lips, narrow and slightly oblique eyes, square and broad shoulders, and middling in stature. They are all, even the young, more or less wrinkled in appearance, and the old are described as hideous from it. They own large flocks of sheep, and herds of cattle and goats, the poorest among them owning five or six yak cows, a few bulls, and from twenty to thirty of each of sheep and goats. The wild yak of the country is always black, and much larger than the tame species. Both kinds are covered with long hair, at the roots of which large quantities of a description of soft wool, like soft downy moss, grow. This wool is extensively used in weaving blankets and making ropes. The goats of the country are the celebrated shawl goat, which are found all over the region from the Pangong Lake to those of Manasarowar. The wool finds its way chiefly into Gartok, where the Kashmiri traders buy it up, a considerable quantity being brought to Amritsar in the Punjab. Lower down the basins of the Indus and Sutlej rivers, a mule yak, a cross between the ordinary cow of the lower Himalayas and the yak, generally known as the zibu, zoba, or jibu, is principally employed for baggage and agri-

cultural purposes. The yak itself is incapable of standing the summer heat at elevations below 12,000 feet.

The inhabitants of the higher table-lands of Hundes are, generally speaking, nomads, while those residing in the vicinity of arable land, which occurs along the lower parts of the River Sutlej and its tributaries, are semi-nomadic. The dress of the former, in the case of both sexes, is a long loose tunic of sheep-skin, with the wool on. Those in better circumstances have their tunics lined with coarse broadcloth, or some similar stout stuff, imported from India. Boots, which are generally worn, are made of felt with soles of raw hide, turned up at the sides. The food of the people consists chiefly of curd cakes, the flesh of live-stock, and a very small quantity of barley meal. The principal beverage of the country is tea, and a spirituous liquor made from fermented barley is also drunk.

Mr. Ryall found that, at elevations of 15,000 and 18,000 feet, the wind blows furiously till about 2 P.M., when it acquires its greatest speed, of about 35 miles per hour. On the passes it is very little short of a hurricane. Whirlwinds sometimes occur there, but, fortunately, rarely. On the Balchdhurra Pass, a Bhotia, a few years before Mr. Ryall's visit, was lifted off the ground, carried away some 100 yards or so, and then, dropping, was dashed to pieces. The high winds on the plains of Tibet render travelling against it a most toilsome undertaking, and the observation of distant signals a very difficult matter.

The inhabitants of the districts occupying the northern valleys of the Himalayas, from Kumáon on the east to Bashahr on the west, have intimate commercial relations with those of Hundes on the one hand, and India on the other. Their districts, taken in order from the west, are Bashahr, Nilang, at the head of the Bhagirathi, in Independent Garhwál, Mana and Niti in British Garhwál, and Johar, Darma, and Byans, in Kumáon, these being also known as the Bhotia Mehals of Kumáon and Garhwál. The Bashahris are known to carry on trade between Tibet and Amritsar, Ludhiana, and Nurpur, in the Punjab, the trade consisting chiefly in shawl-wool and borax, for which they bring back in return coarsely made clothes, the coarse English broadcloths and cotton goods. The Bashahris are the only inhabitants of the higher Himalayas who are privileged to travel all over Tibet without molestation on the part of the Lhassa or Chinese officials. The others are neither permitted to cross further north than Gartok nor eastward of the Mariam-la Pass. The people of Nilang differ in no way from those of Hundes. The districts of Mana, Niti, Johar, Darma, and Byans are also known as the Bhotia Mehals of Kumáon and Garhwál. These Bhotias are a people of a most enterprising character. They are of a mixed Tartar origin, the Tartar lineaments predominating. Some of the men and women are decidedly good-looking.

The roads leading through the Johar, Darma, and Byans valleys are

barely practicable. The following description of the first of the three roads leading through Milam, would apply almost equally to the other two. "It passes along the sides of a deep and stupendous gorge, overhung mostly by lofty precipices of granite. The roadway is a mere series of narrow steps built along the faces of rugged cliffs, and where the side of the latter is too smooth, the smooth intervals are spanned by narrow planks. The road is one series of ups and downs, sometimes rising to the height of a thousand feet above the river and at others descending to its bed. Fatal catastrophes along it are not uncommon. During the rains and the melting of the snow, to insecurity under foot must be added dangers overhead from avalanches and mountain slips, which bring down with them showers of large rocks. To keep such roads in a barely passable state is a matter of great toil to the Bhotias. The goods are carried on the backs of goats and sheep, on ponies, mule yaks or zobas, donkeys and mules. Often the beasts of burden, particularly the larger kind, have to be unladen and the loads carried by the men themselves, while in some instances the animals are helped over by means of slings and other contrivances. In spite of such difficulties, the Bhotia carries on a fairly remunerative trade with Hundes and Gartok."

The Bhotia also practises husbandry to a limited extent, but since the country has come under British rule, trade has become so much more secure as to pay better, and agriculture has been greatly abandoned. Of late, however, owing to borax having fallen nearly 70 per cent. in price, the people are taking more largely to cultivation.

The villages in the Bhot mehals and their cultivable lands stand at an average altitude of 10,200 feet above sea-level, and consequently little else besides very hardy cereals is cultivated. Wheat is only sown "on chance," and often gets destroyed by early frosts before reaching maturity. Several vegetables are cultivated, and the gooseberry, red and white currants, raspberry, and strawberry are indigenous.

The inhabitants of the Mana Valley and of Nilang deal principally in salt, blankets, and yaks, in exchange for which they give grain. The well-to-do traders of all the above-named valleys bring English piece goods, broadcloths, Delhi-worked brocades, real and imitation gold and silver-lace, precious stones, &c., and resort during the beginning of September to the fair at Gartok, where they find a ready sale for such articles.

The Bhot valleys of Kumáon and Garhwál have from a very remote period been colonised by emigrants from Tibet, and were in those days considered as part of Tibet. From the circumstance, however, of their residing longer among the lower hill tribes than among the Hunias, the Bhotias are gradually beginning to lose all knowledge of the language of their mother-country, very few Tibetan words being now used by them. The women especially are almost entirely ignorant of Tibetan.

Until quite recently, the Bhotias enjoyed an immunity from the side of the British Government from all taxation, but now, owing to their increased prosperity, they are assessed, but very slightly.

The dress of the men of the Mana, Niti, and Milam valleys, consists of a long tunic made of home-spun serge (*puttu*), and trousers of the same material; round their waist they wear cotton cloth tied in folds, and for a head-dress, a turban tied over a skull-cap. Both the men and women are extremely fond of ornaments, which in the case of the latter, consist of large solid rings of silver, called *malas*, worn round the neck, necklaces of silver chain and of coins strung together, bangles, festoons of small silver coin suspended from the hair on to the forehead, earrings and nose-rings. Some of them really carry an astonishing weight of silver.

The Bhotias have no written religious tenets, and a few of the Buddhist superstitions still linger among them. On the whole they abide by Hindu customs of worship, though they are looked down upon by all orthodox Hindus, and celebrate all their religious holidays with feasts and copious draughts of spirituous liquors.

There are five principal passes leading into Hundes from the five different ghats in British territory, and the traffic over them can only be carried on between the 15th June and the 15th October, but they are not supposed to be open until declared so by the Lhasa Government, who first satisfy themselves as to the absence of epidemics in the ghats.

The articles of commerce brought from Hundes include gold, which is produced from the gold-fields at Thok Jalung (about 100 miles north-east of Gartok), and which exists also about the Sutlej Valley in Hundes, and in large quantities along the shores of the Manasarowar lakes, but very little of which finds its way to India. The export of shawl-wool (*pashm*) to India has fallen off, but it is capable of much enlargement, so much so, that the Bhotia traders say that if they could but get a sufficient sale for pashm in the North-West Provinces they would not care for the depression in the borax trade. The finest pashm is to be had in the neighbourhood of the Manasarowar lakes; the greatest portion of the product is taken to Gartok, where the Kashmiri merchants from Ladakh buy it up for the Kashmiri manufactories. Sheep's wool is almost entirely exported to the north and midland districts of the Himalayas, the people of which manufacture it into blankets and serges for home consumption. Tea, which comes only from Lhasa, principally finds its way to the Central Asian markets, Ladakh and Kashmir. A little of it goes to Amritsar, where the Kashmiris resident there chiefly consume it, and some of it is also purchased by the Bhotias, who prefer it to the Indian varieties. A similar prejudice against Indian teas is entertained by the natives of Hundes, and this prejudice is kept alive by Chinese officials, who are extremely jealous regarding the introduction of the Indian teas into Tibetan markets, and who impose a

fine on any trader found trafficking in Indian teas. Tea is one of the principal sources of income to the Lhasa Government, and it is not surprising to find them guarding their trade in this article with jealous caution. There are eight varieties of tea which are all said to come from China, and the price of which at Gartok ranges from 1 to 8 rupees. Horses are bred in large numbers in Chumurti, Tsaparang, and Budok. They are of small stature, seldom exceeding thirteen hands, remarkably sure-footed, being able to climb about the hill sides almost as well as goats, and they find a ready sale at prices varying between 100 and 400 rupees, at the different hill stations, such as Almora, Ranikhet, Naini Tal, Massuri (Mussoorie), and Simla. Shawl-wool goats are brought into the Himalayas at the rate of about 3000 to 4000 annually, and mostly sold to the Hindus for sacrificial purposes. Their export would be greatly diminished had a larger demand for their wool existed in the North-West Provinces. Salt and borax may be had for the mere digging in the neighbourhood of the gold-fields of Thok Jalung. Broadcloth fetching 1 rupee 4 annas to 4 rupees 8 annas per yard is in large demand at Lhasa, as well as cotton goods of all kinds. For indigo there is a lively demand in the markets of Shigatze and Lhasa.

Turquoises are supplied from Yarkand, Khotan, &c., through the Ladakhi traders, and also in small quantities from India. Rubies in small numbers, and occasionally a few emeralds, find their way into Eastern Tibet. Corals and pearls of inconsiderable value are also in some requisition among the better classes of women all over Tibet. Silver in British-Indian coin, chiefly as ornaments, is in much request in Eastern Tibet, but the Bhotias cannot indulge the taste of the Tibetans in this, except to a limited degree, exchange for grain being much more profitable.

The second Trans-Himalayan exploring narrative in the New Indian Survey Report relates to Mr. T. Kinney's researches while surveying the western sources of the Ganges from Nilang up to the main watershed of the Himalayas, and thence fixing as many points beyond the frontier as possible, and sketching the district of Tsaparang or Chuprang in Hundes.

Mr. Kinney left Nilang on the 4th September, carrying his supplies on the backs of sheep and goats, and three days later reached a point about 10 miles from the Tsang-chok-la, the eastern of the two passes at the head of the Nilang Valley. Here opposition began to be raised by the Hunias to the further progress of Mr. Kinney and his duffadar, but the former was undeterred and visited three stations over 19,000 feet high. Out of regard to the safety of the coolies, Mr. Kinney could never encamp higher than 14,000 or 15,000 feet, so at most of the stations an ascent of over 4000 or 5000 feet was involved before observations could be commenced.

The features of the Nilang Valley correspond with the general

physical geography of this belt of the Himalayas as observed in other valleys; the main watershed being as a rule lower, and its slopes easier than the southern and more interrupted range on which the highest groups of snowy peaks occur. The Jadh Ganga is the westernmost feeder of the Ganges, and, with exception of the head-waters of the Tons and Jumna, the westernmost drainage of the Himalayas which falls into the Bay of Bengal, the valleys beyond the western limit of the Nilang Valley draining into the Sutlej. The entrance to the Nilang Valley from Bhaironghati is through a terrific gorge, the river-bed being encompassed by snowy peaks, from 20,000 to 21,000 feet in height, towering apparently immediately overhead. The *Sangha* or spar bridge over the river in Captain J. A. Hodgson's time (1817), has been replaced by a light suspension bridge higher up over the Jadh Ganga, but as this bridge is 380 feet long, 400 feet above the water, only 3 feet wide, with a light wire rope as side railing, and sways about considerably, it requires good nerves to enable travellers to cross it. It was built by Mr. O'Callaghan, of the Forest Department, and is a triumph of amateur engineering. Above the junction of the Mana Gadh, a large glacier-fed stream, the valley gradually opens out and the hills assume a softer and more gentle aspect. The grass and heather have a peculiar sickly scent, which produces a certain sense of faintness and a total inability for further exertion in such as are peculiarly subject to its influence. Above the limit of vegetation, which is here about 17,000 feet, the hills become steeper again, and the surface a strangely confused mass of loose rocks intermixed with patches of ice and snow.

Over a spur rising to a height of about 15,000 feet, Mr. Kinney saw the Trans-Sutlej Plain, a plateau apparently sloping gently from the snow-crowned range bounding it to the northward down to the banks of the Sutlej, which are here said to be precipitous cliffs often over 1000 feet. One of the isolated peaks in this plateau fixed as K 3 rises at its western extremity boldly and abruptly to a height of about 1500 feet above the surrounding plains, sloping off gradually towards the east. From where Mr. Kinney beheld it, it bore a fancied resemblance to some monster couched with head erect.

Passing over the detailed topography which is described by Mr. Kinney, we may notice his remarks respecting the customs of the Hunias, in the western portion of Hundes. He observes they have the same uncleanly habits, the same social institutions, and the same fondness for drink as those described by Mr. Ryall. Their *chang*, a kind of beer without any bitter ingredient, is usually made from rye, but occasionally from barley, and is drunk when fresh made. They are very fond of tea, which they drink mixed with butter, and in large quantities. Brick tea is in general use throughout Tibet at about one rupee per pound, a sum considerably above its intrinsic value. The Lhasa Government force the sale of tea on their subjects by issuing a certain quantity of

it to the governor of each province, for which he has to credit them with a fixed sum. He serves this tea out to the people of his district in quantities according to the wealth and standing of the family, whether they want it or not, and fixes the price himself, which includes a large margin for personal profit. Almost every family is obliged to take some tea, the poorest only being passed over.

The Dogkwas of the Tsaparang district are nomads living entirely in tents, and owning large flocks of sheep, goats, and yaks, with which they roam about, coming up to the grazing grounds on the higher hills during the summer, and in winter descending to the Sutlej plains. They are the chief carriers of the trade of the district.

The Jadhs are professed Buddhists, in race partly Tartar and partly Bashahri, with a strain of Garhwali blood. The former element is due to intermarriage, and the latter probably to the presence of slave girls (who are nevertheless well treated) in the households of the Jadhs. The trade passing up and down the Nilang Valley is chiefly in their hands, the Kampas and a few of the Garhwalis from the higher villages also competing with them. The Kampas are the only people who are at liberty to travel all over Tibet without question. The chief export over the frontier is grain; the imports are salt, wool, pashmina, yellow arsenic, and a few pieces of pattu. No gold or borax is imported. The estimated value of the trade across the passes at the head of the Nilang Valley is from Rs. 25,000 to Rs. 30,000 yearly. The Raja of Tihri formerly levied an *ad valorem* duty of one anna in the rupee on all imports (= $6\frac{1}{4}$ per cent.). In 1878, however, a new impost of about 20 per cent. on the salt was levied, and the effect of this on the trade is described as most disastrous, the Jadhs having had to borrow money to defray the same.

GEOGRAPHICAL NOTES.

The East African Expedition under Mr. Keith Johnston left the coast for the interior on the 19th May. Up to the eve of starting, the leader reported that all was going smoothly and satisfactorily. The Sultan of Zanzibar had been most gracious, and Dr. Kirk had given throughout his powerful aid in facilitating all the arrangements of the expedition. The party, consisting of 138 natives, besides the leader and his companion, were conveyed from Zanzibar to Dar-es-Salaam on the 14th in the *Star*, one of the Sultan's steamships, placed at Dr. Kirk's disposal for the purpose. Thus the danger and inconvenience of a dhow passage were avoided, and men and goods landed with great ease and comfort. Dr. Kirk, who accompanied them to the mainland to ensure them a fair start, reports that from all he could learn at Dar-es-Salaam Mr. Johnston commences his journey under the most favourable combination of circumstances possible, and will within a few days enter a new