

REPORT
ON THE
Route to the Karakash River
VIA THE
Changchenmoo Valley and Pass,
BY DR. H. CAYLEY,
ON SPECIAL DUTY AT LADAKH.



REPORT

ON THE

Route to the Karakash River

VIA THE

Changchenmoo Valley and Pass.

Report on route from Ladakh to Eastern Turkistan *via* Changchenmoo to the Karakash river.

I have the honor to submit the following report on the route to the Karakash river, *via* the Changchenmoo Valley and Pass.

1. My object in travelling over this road was to ascertain if it is superior or otherwise, for general purposes of traffic and communication, to the route by Nubra and the Karakorum Pass. I had often heard the Changchenmoo route described as practicable and easy, but at the same time there were conflicting accounts regarding it: sometimes it was said to be unsuitable owing to absence of water and grass, and other objections were made against it. In former years there was undoubtedly a frequented road in that direction, as well as one further east through Chanthang to Khotan, but for many years the Changchenmoo route has been almost disused, and Chanthang is entirely closed by the jealous exclusiveness of the L'hasa Government. The former of these roads was taken by A. Schlagentweit in 1857, and again by Mr. Johnson in his journey to Khotan 3 years ago, but the road which I followed differs somewhat from that taken on either of the above occasions, and is shorter and better supplied with both grass and water.

Object proposed to be attained by exploring the route.

2. I was accompanied on the journey by Kazi Kutab Dín, the Vakeel of the Maharajah of Kashmir, and I was very glad that he should see and judge of the character of the route, and be able to describe it to his own Government.

Was accompanied by the Kashmir Vakeel, who will be able to report to his own Government on the route.

I cannot help acknowledging the zeal and energy with which he entered upon the undertaking in spite of the most discouraging reports, and the cheerfulness with which he bore the fatigues and discomforts of the journey. The Wazír of Ladákh, Alí Akbar Shah, gave every assistance in our preparations for the journey.

3. In the following itinerary I have not given the exact marches we made either on going or returning, as on the outward journey we were, owing to the ignorance of the guide, more than once led astray from the proper route ; and on the return, from a similar cause, we

Gives the stages, the distances between each. Remarks on state of the route and features of the country. Explains why he did not himself follow precisely this line.

were forced to take double marches as far as Changchenmoo, as at the Karakash river I discovered that our supplies of food had run short. When we left our heavy baggage in Changchenmoo valley, I ordered the servants and coolies to carry on with them provisions for 14 days ; but the guide, an old "shikaree" of great repute in these regions, assured them that by the route he knew we should be back much more quickly, and they without my knowledge only took on enough for 10 days. On this account we had to hurry back at all speed, and met our fresh supplies only after the last morsel of food in camp had been consumed. I have, however, described the exact line of road taken on the return march, but divided the stages into convenient distances, where at the same time water, grass, &c., are procurable at the halting grounds.

4. *Stage 1st, Leh to Tikse*—12 miles.—An easy level road first down the Leh valley, then up the right bank of the Indus to the large village of Tikse.

2nd. Tikse to Chimre—16 miles.—Direction south-east up the Indus, and then north-east up the Chimre valley. Road good and nearly level. At Chimre is a large village; just opposite the entrance of the Chimre valley there is a good bridge on the Indus at Machalang, the 2nd stage out of Leh on the main road from Léh to Lahoul and Kullu.

3rd. Chimre to Zingrál, 10 or 11 miles, north-east up the Chimré valley through the villages of Sakté and Jagar. The road is good but ascends considerably. There is no permanent village at Zingrál (*Zhing-ral* means the “field decayed or ruined.”) There is here an old artificial lake and traces of former habitation and cultivation, but only huts and tents occupied during summer by shepherds. Grass and fuel are plentiful. From this place there are two passes over the range of mountains bounding the Indus valley on the north (the Kylás or Gangri range); one, the Changlá, goes over to Durgul (Changlá, eastern pass); the other, the Kélá, (neck pass) leads direct to Tantsi, and gives half a day’s march. I returned by this pass: it is much higher than the other, being 18,400 feet, and though shorter, the ascent and descent are steep and stony, and it would probably never become much used; it is now, however, often taken by the traders to and from Rudok to save time. I would here observe that in the new Trigonometrical Survey Map of Ladákh these two passes, the Kélá and Changlá, are made to lead over from the head of the Ugú valley further to the east, and not from the Chimré valley as is really the case; this is an error very likely to mislead travellers. The pass at the head of the Ugú valley, the Ugulá

is merely an almost unused foot-track, and leads over into another valley far to the east.

4th. *Zingral to Durgu*, about 18 miles over the Chang-lá, direction north-east.

The road, which is much frequented leads by a very gradual ascent of about 4 miles to the crest of the pass, which I estimate at about 17,000 feet high. The descent is easy and gradual down a valley which is at first a little stony, but soon becomes wide, smooth and grassy. After about 12 miles, the road turns east over a sandy alluvial spur to the village of Durgu. The pass is excessively easy, and the road does not offer a single difficulty.

5th. *Durgu, through Tantsé to Muglib*, 15 miles. First south-east to Tantsé 7 miles, where there is a village and Government depot at which stores of all kinds, as flour, barley, ghee, sheep, &c., can be procured; then north-east for 8 miles to Muglib, where there is a small village, and wide grassy camping grounds. The road is good, and nearly level, running along the stream, and generally over smooth lawn-like turf.

6th. *Muglib to Lukung*, 14 miles. First 12 miles south-east along a narrow and almost level sandy ravine to near the head of the Pangong lake; the road then turns north over a plain of deep sand for two miles to the small hamlet of Lukung (*Lukhúng*—the “fountain god’s hollow,” or “fountain valley”). The ravine above Muglib evidently once drained the Pangong lake. It widens out in several parts of its course, and contains three or four small fresh water lakes, which are fringed with grass. Along the sandy bed of the ravine, the *Myricaria elegans* and a yellow honey-suckle grow in great luxuriance, and a beautiful yellow-flowered *Clematis* is seen hanging in festoons from the rocks on either hand.

From Lukung a direct road runs south-east along the Pang-gong lake through Chushul to the Indus, and then direct either by Rupshu to Lahoul or by the Parang-lá to Spítí. For traders passing between our provinces and Yarkund, this route would save 5 or 6 marches over the one round by Léh, and is everywhere easy. *

7th. *Lukung, through Chagra to Lúnka, 13 miles.* The road first runs 7 miles north-east over some gravelly ridges, and up a grassy valley to Chagra, where there is a larger camping and grazing ground of the Pangong shepherds and herdsmen, and which is the last permanent residence in this direction; and then east up a gravelly valley for 6 miles, to a grassy camping ground called Lungka (Lung-kha, "valley snow") at the foot of the Másímik pass. The road is good, and the ascent very easy; wood, grass, and water, are plentiful. The word *Chagra* or *Chaga* means "washing place," and there is a slightly warm spring containing soda which is much resorted to for the purpose of washing new "pattús"—woolen cloth. Small trout abound in the stream. About 2 miles north-east of Lukung, there is a grassy valley, which is every year occupied by traders from Chantháng, who come in the summer with hundreds of sheep laden with wool, salt, &c., which they barter with the Ladakhís and others for grain, flour, cotton goods, and other articles. These men are called Chák-pa (Chagpa—"cut-throats"), and come from Maching, a district about 1 month's journey to the eastward;

* NOTE.—The stages on these routes are as follows:—

- | | | |
|----------|---|--|
| 1. | From Lukung to Man. | } Easy level road along south shore of the Pang-gong lake. |
| 2. | Man to Chushal. | |
| 3 and 4. | Chushal over a low pass to the Indus at Chumathang. There are also fords and ferries over the Indus at Mya and Níma, a few miles higher up. | |
| 5. | Chumathang to Puga. | |

From Puga there are 2 routes, one leading by the Isomoriri lake and Paranglá (pass) reaches Spítí in 6 marches. The pass is steep and high, but this route is now often followed by the traders of Spítí and Bisahar coming to Léh. The other reaches Rupshu in 2 marches from Puga, and there joins the main road from Kullu and Lahoul to Ladákh at a point 7 marches distant from Kyelang in Lahoul.

they were formerly a race of Tartar robbers, but have been forced by the L'hasa Government into following the more harmless occupation of trade.

8th. *Lungka, over the Másimik pass to Gunlé, about 18 miles.* First nearly east for about 5 miles to the top of the pass, which is nearly 19,000 feet high, but its ascent is very easy and gradual. From the crest of the pass the road descends to the north down a narrow valley for about 13 miles to Gunlé, passing through two camping grounds called *Rimdi* (*Ringdi*—the “long valley”) and *Pang-long*—(the “grassy valley”). The descent is very gradual, and quite easy for laden horses, and a very little labor employed in clearing away stones, &c., over 2 or 3 miles of the roughest part would make the road quite good. Fuel and grass are found almost everywhere. Gunlé (“winter enclosure”) is as its name implies a winter residence resorted to by the Pangong shepherds.

9th. *Gunlé to Gogra, about 20 miles.* The road first runs north down the Gunlé stream for 7 miles to near Pamchalan on the Changchenmoo river, then turns over a low sandy spur, and runs east up the left bank of the Changchenmoo river for about 7 miles; it then crosses the stream by a ford, and continues north-east over a low mountain ridge, lying in the bend of the river, to Gogra (the “garlic ground”) where there is a wide level grassy camping ground covered with bushes of *Myricaria*. Gogra is situated in the upper valley of the Changchenmoo, a few miles above the acute bend that the river takes in the middle part of its course. At Pamchalan, or Pamlan as it is also called, there is quite a jungle of *Myricaria elegans*, and abundance of pasture, and both this place and Gogra are winter pasture grounds of the shepherds. The road is everywhere easy and nearly level, but is rather heavy in places from deep sand and pebbly gravel.

The river at the crossing is about 100 yards wide, and is divided into 3 or 4 channels; it has a rapid stream, and when at its highest is about 4 feet deep. It runs over a level, shingly, and not rocky, bottom, which very much lessens the difficulty of crossing. The water varies greatly in depth, not only at different seasons, but also at different times of the day. It is always lowest in the morning, begins to rise about noon, reaches its height shortly after nightfall, and sinks again by morning. The daily rise in clear weather is from 12 to 18 inches, and is owing to the melting of the snow of the previous day on the mountain near the head of the river. The river is fullest at the end of May, and again from the middle of July to the middle of August. I crossed it twice on foot, the second time on July 25th, there was then about 3 feet of water in the deepest part. It presented no difficulty of any kind, and would never be any obstacle to traffic like the Shyok river on the other route, as it is, I believe, always easily fordable in the forenoon. Two English travellers who crossed it about a fortnight later than I did, described it as being a little deeper, but their baggage was carried over on yaks without damage.

There is another route, which continues eastward up the left bank of the Changchenmoo river to its bend at Kyám, and which was taken by Mr. Johnson in his journey to Khotan. It is considerably longer than the one I followed, and as the river has to be crossed twice within 2 miles it is no saving in that respect.

10th. From Gogra the road crosses the northern bend of the Changchenmoo river, and runs north-east up the Changlung valley for about 16 miles to near the foot of the pass over the range of mountains bounding the Changchenmoo valley to the north.

The Changchenmoo river from its source first runs east by south to a point a few miles below Gogra and opposite Kyam,

it then turns due west, which course it retains to its junction with the Shyok, so that the road crosses it twice. I found this ford less deep than the first, and easier to cross. The water begins to rise about 2 hours earlier than at the first, and attains its height about sunset. The path up the Changlung ("Eastern Valley") was generally very easy over gravelly alluvial slopes, and the ascent very gradual. In a few places the road requires a little making to avoid frequently crossing the stream, which however is not deep. Seven miles above Gogra the Changlung valley widens out into a flat basin, full of hot springs and fountains, and six miles above this it divides into two ravines;—one, with the larger stream coming down from the right or north-east, leads over a high (over 19,000 feet) and rather rough but perfectly easy pass to Nischu, north of the range; we followed this road on the outward journey. The other ravine from the left or north-by-west leads over a much easier pass, at least 1,000 feet lower than the other, and with the most gradual easy ascent and descent. This second pass we discovered on going, and on our return came over it and found the road much the shorter of the two as well as better. At the junction of the two ravines is a lofty pyramidal mountain, scarped at the base, where it displays regular strata of sandstone and slate rocks, dipping from each side towards the centre and meeting at nearly a right angle. This makes a most unmistakable land-mark. I had cairns of stones erected here and at many other places to mark the road, and in this rainless climate they will last for years.

At the camping ground, and almost everywhere up the valley to within 5 or 6 miles of the pass, fuel and grass were plentiful.

11th. *From the head of the Changlung valley over the pass to Nischu, about 15 miles.* The road at first ascends gradually for

about 9 miles in a northerly direction to the top of the pass, then turns nearly east and descends gently along the banks of a small stream for about 6 miles to its junction with another stream from the south-east. The latter leads down from the high pass crossed by Mr. Johnson, and the valley at the junction of the two streams is called in his route maps Nischu ("The two Waters"). This as well as nearly all the names of places beyond Changchenmoo are arbitrary, and quite unknown to the people, even to those who have travelled through the country. The Tibetans have the most fertile imaginations for inventing names, and with the exception of a few well known places they give new names on every fresh occasion that offers.

The route I have just described seems to be by far the shortest and easiest of those over this range of mountains, and the pass much lower than any of the others. There is a pass still further west, which was crossed by A. Schlagintweit, of whose journey I saw frequent traces, but it is much higher and more difficult. It is called *Bao-la* ("Cave Pass") from some caves in the ravine on the south side. This range of mountains is the eastern continuation of the Karakorum range. In the Nischu valley for many miles down there is neither grass nor fuel, and though water is plentiful there is scarcely a trace of vegetation of any kind.

From this point the baggage yaks and other animals were sent back to the other side of the pass, as there was known to be a scarcity of pasture on ahead; one pony only was taken on by the Vakil, and the baggage was carried by coolies.

I have thus far given the route in short stages, which can be changed at pleasure, as camping-grounds exist almost everywhere, well supplied with grass and fuel, and the marches can be lengthened or shortened to suit the convenience of the traveller.

12th. *Nischu to a camping ground on the plain north of the Changchenmoo range of mountains, about 22 miles.* The road first runs north down the valley for 9 miles, then turns north-by-west across a series of broad flat gravelly ridges for 5 more to the edge of a wide level plain, in which the outermost ridge ends abruptly in a descent of 2 or 3 hundred feet. This plain (called Zhang-ri-thang—"Mountain Plain") stretches far away to the north, in which direction it is bounded at a distance of about 20 miles by a range of rocky mountains almost bare of snow. Just before reaching the plain, the dry clay bed of an old lake is crossed. Descending on to the plain, the road runs nearly due north, making for a castle-like rocky eminence in the centre of the opposite range, and after about 8 miles meets with a chain of small fresh water pools and rills lying in a long shallow hollow or ravine, which forms an excellent camping ground. The ravine has a direction from west to east, and comes from the snowy ranges to the south and west. In some seasons there is here a stream of water, which flows north-east into Tso-thang lake, 15 miles distant. If there is no water to be found here on the surface it can I believe always be got by digging down a few inches, as the ground here never dries up. Fuel is abundant on the surface of the plain, but there is no grass; horses however eat the tufts of *Eurotia*, which grow almost everywhere and constitute the only food of the antelope in these regions.

13th. *From last encampment nearly due north across the plain to its northern edge, and then down a ravine to a camping ground near the centre of the opposite range of mountains; total distance about 23 miles.* The road first lies nearly due north across the plain over sand and gravel for about twelve miles, then crosses a wide flat-topped gravelly ridge some 3 or 4

hundred feet high and five miles across. This is the actual watershed of the range, and all the valleys to the north run down by more or less tortuous course through a belt of rocky mountains to a second large plain lying fifteen miles to the north-east. From the top of the ridge just mentioned any one of these ravines may be followed, and all contain water and grass in some part of their course. This range of rocky mountains runs in a general direction north-west to south-east, and about its centre rise two remarkable lofty craggy eminences, visible from a great distance as they tower above all the others near them, and between the two over a low pass lies the shortest route, as far as I could judge, though by following the ravine either to the right or left of them, no pass has to be crossed. These two eminences are from one to two miles apart, the more easterly has somewhat the form of a vast dome with a rugged broken surface, the other to the left looks like a square tower with a small central peak or spire rising out of a sloping conical base, conspicuous for the red and purple rocks on its surface. Immediately after leaving the Nischu valley these two peaks form most conspicuous features in the landscape.

After crossing the ridge between the two and turning over a low sandy spur to the right, the road turns north down a gorge through lofty cliffs of white quartz, rising in broken peaks to a height of a thousand feet and upwards, and enters a verdant valley with the mountain slopes green with grass, and a stream of clear water running down the centre, through turfy banks carpeted with flowers. This march may be divided by crossing the large plain in a direction north-by-east to a large lake called Tsothang ("Lake of the Plain"), and encamping on its margin, the water of the lake is somewhat brackish, but quite potable; fuel is found near it, but no grass. On our way out we encamped on the

north side of this lake, but returning we left it six or seven miles to the east, and thus saved a march.

14th. *From the last camp among the mountains,—twelve miles north-west, to a place called Thaldat.* The direction is first *north-west* over a low pass, then *north* down a wide sandy valley, and lastly *west* over a wide low gravelly spur to the foot of a lofty pinnacle-like crag, which terminates one of the spurs of the central range of mountains and overhangs a second wide plain. This plain like the first extends far away to the north and east, and contains several salt lakes, and the surface is over a large extent covered with white saline efflorescence, in some places a foot and more in depth; on the east side of this rock is a verdant grassy hollow, through which a small stream of clean sweet water runs north towards the nearest salt lake, though like all the other streams in this region it sinks into the sandy soil before it reaches the open plain. Fuel is plentiful all round. Two miles beyond this and on the west side of the same crag there is a second path of verdure, surrounding a number of springs and small ponds of intensely salt bitter water; one of them is however only brackish and quite fit for drinking. Both these places were called Thaldat by the guide, and the name seemed well known to many of the coolies; it means "Ice or Snow Ground," and is so called from a lake of snow about a mile to the north out in the open plain. It is called *Mapothang* in the new survey map, but as this word has an objectionable meaning in the Tibetan language, the name Thaldat given by the coolies, and which seemed well known, is far preferable.

From this place two roads may be taken; one leads north-east across the salt plain to the foot of the mountain on its north side, and then over the Khatai Diwan (pass) and through a valley among the mountains to the Karakash. This route, which is des-

cribed by Mr. Johnson in his published report, gives a distance of nearly 50 miles without fresh water and almost without grass; the other route, which I followed, leads north-west along the foot of the mountains to a pass at the west corner of the salt plain, and then traverses a third level plain to the valley at the head of the Karakash. It is shorter than the other, and grass, fuel and water are plentiful about midway.

15th. *From Thaldat, twelve miles north-west along the side of the salt plain, then six miles over a low pass to a valley called by the coolies Patsalung.* The road at first skirts the base of the range of mountains on the south-west side of the salt plain for ten miles, then crosses a wide sandy valley running down from the westward to a small patch of swampy ground at the foot of a rocky spur, where fuel and water are procurable and which forms a good camping ground. The water cannot always be obtained without digging below the surface. From this the road ascends gently up a ravine to the north-west, and crosses a low easy pass six or seven hundred feet high, and descends by an equally gentle slope to Patsalung (the "Soda Valley"), a valley opening out into the south end of a third large plain, which is in great part covered with salt and contains three or four salt lakes. At the lower part of the valley we found abundant fuel and water, and on the sides of the hills leading up to the pass grass was plentiful.

16th. *From the last halting place 20 miles nearly due north to a camping ground in a wide grassy valley called Lung-ding, about nine or ten miles from the Karakash river.* The road at first turned north-by-west across a wide sandy valley, and along the base of a range of mountains bounding the third salt plain*

* The route taken by A. Schalgintweit in 1857, skirted the N. E. side of this plain, and that followed by Mr. Johnson kept amongst the mountains to the N. E. without emerging on this plain at all.

on its west side, then crossed the plain to its northern corner, and skirting the east side of a salt lake entered the Lung-ding ("Valley Plain"), a broad grassy valley containing springs of fresh water, fuel &c., in abundance. There is unlimited pasturage for animals in and around this valley. This march was rather heavy, owing to having to cross, for ten or twelve miles, a surface of rough salt, into which the feet sank at every step; much of this may however be avoided by skirting the sides of the plain and crossing at the narrowest part about half way, where it is little over four miles across; by this a few miles are added to the length of the march. This stage of twenty miles is the longest in the whole journey without finding water, grass or fuel on the road.

17th. From the camp in Lung-ding to the Karakash river, nine or ten miles.—First north for five miles along the valley, then north-west by the dry bed of an old lake, and down a rather steep sandy ravine between banks of boulder alluvium to the Karakash, some twenty miles from its source.

This river here runs in a gorge 2 or 3 hundred yards across, and divides into numerous channels, running between beds of grass and flowers, with granite boulders strewn all about; there are a few roofless huts on each side of the river, built by previous travellers.

From this point there is a well-known route down the Karakash river to Shadula, one of the halting places on the road to Yarkund by the Karakorum pass, and 4 or 5 marches north of that pass and 8 or 9 from Yarkund. I had with me three men who had been down the Karakash to Shadula. The distance is about five marches, and they all described the road as level and easy, and after the first march abounding in grass, fuel &c. Lower down the valley contains thick jungle.

It is a much frequented pasture ground of the nomad shepherds of Yarkund and Khotan. Mahomed Amin, who accompanied A. Schlagintweit in 1857, gives the same description of it.

5. In the above route I have given the distance to the valley near the head of the Karakash as sixteen marches, but it can easily be reached in twelve or thirteen, and merchants with their laden horses would seldom take longer, as they frequently go 25 and 30 miles a day. On my return journey I reached Leh in 13 marches, walking the whole way, and crossed the pass into the Changchenmoo valley in 5 marches from the Karakash, the baggage being carried all the time by coolies. This route in fact is not longer than that by the Karakorum pass.

The route detailed gives 16 stages, but merchants could do it in 12 or 13 days.

6. In discussing the comparative merits of these two routes between Ladakh and Yarkund, I will first point out some of the difficulties of the Karakorum road that are invariably complained of by the traders and others who have traversed it, and compare them with the worst obstacles to be encountered on the other.

Comparison of the Karakorum route, now generally used, and the Changchenmoo route.

1st. The pass over the Kylas range from Leh to Nubra. There are two roads from Leh, one leading over the Kardong pass, which is 17,500 feet high, excessively steep and stony, and has nearly 1,000 feet of steep glacier on the north side and cannot be crossed by laden horses. All merchandize coming from Yarkund has consequently to be carried over on yaks at considerable expense, (Rs. 2 is charged for each horse-load), and involving serious delay from the merchandize being often detained from 1 to 5 weeks in Nubra before carriage can be procured. Unladen horses even cross at great risk. The other pass above Leh, the Sabu or Digar pass, though less steep and stony than the Kardong and free from

Difficulties of the Karakorum route.

glacier, is 100 feet higher, is rough and difficult, and laden horses are seldom taken across; whereas the Changlá over the same Kylás range on the road to Changchenmoo is lower than the Kardong pass, has no snow in summer, the ascent and descent are very gentle and easy, and laden horses cross it without the least risk or difficulty, and a very little labour would render it perfectly good for camels. It is by far the easiest pass across this range of mountains north of the Indus. I have now crossed five of the passes over this range, and the Changlá was the only one fit for laden horses.

2nd. The Shyok river, which has to be crossed in Nubra district, is at some seasons most formidable. The easiest ford is at Diskit, and when I crossed it in August last year the water was nearly a mile broad; and as, owing to the force of the current, this had to be crossed obliquely downwards, it doubled the actual extent of water. The river was divided into 3 or 4 channels, and was in some places nearly four feet deep, with a very rapid stream, so that the baggage could only be taken over on mens' shoulders, and the passage of the river was difficult and much more formidable than the Changchenmoo could ever be. The latter is little above 100 yards broad, seldom over three feet deep, and never unfordable.

3rd. The range of mountains between the Nubra valley and Upper Shyok takes three days to cross, and opposes two high passes, both very steep and stony, and on one there is a considerable extent of glacier which is often both dangerous and difficult; whereas the Masimik pass, between Pangong and Changchenmoo, though nearly 19,000 feet high, is quite free from snow in summer, and the ascent and descent are very gradual and easy, and its height is quite lost from being so little raised above the valley on each side; the next pass leading out of Changchenmoo

to the north is still simpler, and one might ride over both with perfect comfort without once having to dismount. Beyond this there is nothing worthy the name of a pass.

4th. The Shyok river has again to be crossed at Sarsíl (Sasár), and though smaller than in Nubra is deep and rapid, and often difficult. This year already the horse of one of the Hajis with all his property has been carried away in the torrent.

5th. Between Sarsíl and Shadula, 5 or 6 marches, there are two high passes, the Karakorum and the Sukit Diwan, both very rough and stony, and no grass or fuel are found over nearly the whole distance; on the other route, after the Changchenmoo, the only pass is a mere hill of 7 or 8 hundred feet, and nearly the whole way from the Changchenmoo to the Karakash, 6 easy marches, is over smooth level sand and gravel; water is found at the end of every stage; fuel grows almost everywhere; and there are only 3 stages without grass, and only 2 of these are successive; so that in every way this route contrasts most favorably with the Karakorum. None of these roads are very suitable for cattle or sheep, as these animals require so much grass; but for horses, which eat gram, the Changchenmoo offers no difficulties, as the merchants always carry with them a little barley for fodder.

7. The custom now is to take 2 spare horses for every laden animal, to carry grain and fuel and allow for casualties; and each year not less than 20 per cent of the horses die on the road from exhaustion and falling among the huge stones that strew the path, from avalanches, and from being lost in the torrents. It is pitiable to see the state in which most of the animals reach the journey's end, and they are seldom able to march again with less than six weeks' or two months' rest. On

Remarks on number of spare baggage horses needed on the Karakorum route, and the casualties among them owing to the difficulties of the journey.

account of these risks and difficulties the hire of a horse to carry a horse-load (about 200 lbs) of goods between Leh and Yarkund is nearly Rs. 50, for little over 30 marches, or at the enormous rate of nearly 4 annas per lb. The abovementioned losses are never likely to occur on the Changchenmoo route, as there are no difficult mountain passes, no dangerous torrents, no risks of avalanches, and no such rough rocky paths. With very little trouble and labour expended on the first pass and in the Changchenmoo

The Changchenmoo route might easily be made practicable for camels.

valley (and I am in hopes that the Cashmere Government will do the little that is required for improving the road), camels might traverse the whole road with the greatest ease. These animals in Central Arabia go over much more difficult ground, and the short-legged variety, which is accustomed to the rugged barren mountain slopes of the Pamir, is in common use in Yarkund, and a few years ago a caravan of these animals actually came over the Karakorum to Ladak; and I hope therefore that in future years caravans of camels from Central Asia will be seen wending their way along the sandy plains of the Tibetan Indus.

8. The Vakeel Kutub Din who went with me is fully alive

Hopes the Cashmere Government will do the little that is required to render the Changchenmoo route easy for travellers.

to the merits of the route, and his reports will I hope favorably influence His Highness the Maharaja and gain his assistance in opening it out to trade. A little labour employed in a few of the roughest places, a few simple stone huts erected in the most exposed spots, and a plentiful supply of grain (such as is now kept at Sarsíl) at the present Government depôt at Taulse, or still better in Changchenmoo, would remove the few difficulties the route offers. For many years past this route has

The Yarkund Vakeel who traversed this route reports favorably of it.

been so entirely disused, and merchants and others have got such wild stories of its difficulties and dangers, mostly of a highly

absurd nature, that they may not readily take to it. The Yarkund Vakeel, Mahomed Nazar, has just returned by it, and has written back from the Karakash to say that he found it very easy and reached the Karakash with great comfort, and others will in all probability follow. I have heard too that there was a more plentiful supply of water when the Vakil went than when I traversed the road in July. My sole object in opening the road is to afford a means of communication between Ladak and the countries to the north by a way less difficult and dangerous than the Karakorum, so that the immense expense of carriage may be diminished, and thus one of the great obstacles to trade through these regions removed. e

9. In my hurried journey, which only occupied a month, for

The hurried nature of his journey permitted very superficial observations only on the physical features of the country.

I was anxious not to be absent a day longer than necessary, in order that I might meet the Yarkundi merchants on their first arrival at Leh, it was impossible to do more than make very superficial observations on the physical features of the country passed through; but the following slight sketch of certain points may be of interest.

The Kylas range, which is crossed immediately after leaving

Geological formation of the Kylas range.

the Indus valley, is almost entirely composed of brittle granite, everywhere breaking up into a coarse sandy and shingly debris under the influence of the atmosphere, moisture &c. In the beginning of July there was no snow on the south side, even up to a height of 19,000 feet, except in patches and in sheltered situations; on the north side the snow fields were lower, but the continuous snow line was hardly below 19,000 feet.

After passing Tantse the road lies in a narrow valley, between two masses of lofty mountains, that on the south-east being chiefly composed of dark grey granite, and that on the north of schistose rocks, veined in all directions with a tracing of white quartz, and nearer the Pangong lake changing to limestone and gneiss, and conspicuous for the alternate strata of black and white rocks which crop out almost everywhere on the lofty precipitous sides. This valley, a ravine, is hemmed in by lofty cliffs, which are often composed of very white gneiss, and must formerly have been the bed of a river draining the great Pangong lake, the water of which is now about 150 feet below the pass over which it once flowed. Just above Tantse and perched on a narrow ledge of rock is a small gunpa or monastery, the last met with in Ladak in this direction.

Geological formation of the country immediately after passing the Tantse stage.

The shores of the Pangong lake everywhere show traces of the water having once reached high up the mountain sides, and in many places old beaches are very distinct. The water is now extremely salt and bitter, but it was once probably fresh as there are in many places along its shores regular strata of shells 15 or 20 feet above the present surface. I found 3 kinds of shell, a *Lymnaea*, a *Planorbis*, and a small Bivalve the *Cyclas*. These shells exist in myriads, and the two first are similar to the fresh water shells now found in warmer parts of Ladakh. I observed also regular beds of vegetable matter in strata several feet thick, and consisting entirely of long leaves of a water plant similar to one now growing in fresh water streams in the neighbourhood. The only existing animal I could find on the lake was a small shrimp-like crustacean of a reddish color. The people of the neighbourhood say that the water of the lake is

Description of the Pangong lake.

sinking year by year, and have legends of the district having once been very fertile and thickly populated; now it is little more than a sandy desert, and three or four miserable huts at Lukung contain all the permanent inhabitants.

The chain of mountains between Pangong and Changchenmoo is lofty, ranging from 19 to 21 thousand feet, but the sides are everywhere sloping, and the ridges wide and round-topped. They consist almost entirely of granite and other igneous rocks. The snow line even on the north side is not much below 20,000 feet, except in sheltered aspects. There was no snow on the pass (19,000 feet) even early in July, though in sheltered places large fields of snow extended much lower down. Vegetation is scanty, but the valleys generally have grass in abundance; and a *Eurotia*, with dry woody roots, which serve admirably for fuel, is found almost everywhere. I was rather early in the season for flowers, but many *Primulæ*, *Artemisiæ*, *Saxifrages*, and other plants common in Ladakh, were just appearing; and near Gunlé I saw a large patch of a dwarf species of *Eliagnus* at a height of over 17,000 feet.

The Changchenmoo valley is in its upper course wide and verdant, and is a regular winter residence of Pangong shepherds and herdsmen. The valley though 17,000 feet high is sheltered, and contains unlimited wood for fuel. Gunlé, Pamchalán and Gogra are all winter camps. At Pamchalán and Gogra are regular jungles of *Myricaria elegans*, the bushes growing eight and 10 feet high, with branches spreading wide enough to afford shelter from the sun's rays.

The hot springs up the Changlung valley deserve a few words of notice. Seven miles above its junction with the Changchenmoo this valley

Physical aspect of the chain of mountains between Pangong and Changchenmoo.

Description of the Changchenmoo valley.

Hot springs of the Changlung valley.

widens out into a small basin about $\frac{1}{4}$ mile broad and one mile long, full of hot springs and fountains, and the surface of the ground covered with white saline matter, chiefly I believe borax, and other soda salts, including common salt, but I have not yet been able to make a proper analysis. The fountains of hot water are most singular. In one place a boss of stalactite resembling an animal's head, projects out from the side of an overhanging rock, and from its mouth or centre a stream of hot water the size of one's arm shoots out into the river below, with such force that I was unable to hold a thermometer close to the mouth of this natural pipe. In another place a mass of stalactite seven or eight feet high, stood in the middle of the river, and from its summit two jets of hot water shot upwards like artificial fountains. The temperature of the first spring was 120° when the stream below was 45° F. All about the flat valley were small pools of warm water, fringed with luxuriant grass of a deep green colour, and along the sides of the stream and among these pools innumerable minute jets of hot water rose up the height of a few inches. Rocks of quartz, stalactite, and variegated coloured clays and clay slates, assuming most fantastic forms, were scattered about among the springs, and occasional patches of snow occurred within a few feet of the hot water. I noticed Brahminee ducks ("*Casarca Rutila*"), a diver and a species of snipe amongst the hot springs. There are also hot springs at Kyám, where the Changchenmoo river bends round to the west.

The mountains north of Changchenmoo are the eastern continuation of the Kárákorum range. The main ridge is lofty, and nearly all the passes are over 19,000 feet high, and the peaks 1,000 to 1,500 feet higher, but the mountains are generally rounded with sloping sides, so that the passes are very easy to

Physical appearance of the mountains north of Changchenmoo.

cross. In July the snow on the northern face was lying pretty generally as low as 18,000 feet, and in the sheltered aspects much lower.

The lowest pass, by which we returned, was quite free from snow. The spurs running south from this range are at the lower parts chiefly composed of unstratified clays of various colours, red, purple and yellow, mixed with stratified slate rocks; higher up the rocks are chiefly slates and sand-stone, and the top of the ridge is granite. On the north side of the range the mountains presented a very different appearance, being everywhere broad and rounded, and rocks *in situ* scarcely anywhere visible, having, as it were, melted away under atmospheric influences, and crumbled into heaps of sand slaty shingle. Even the tops of the highest peaks and ridges are covered with this debris of the rocks beneath, there being no water force to wash it away. Here and there cliffs and pinnacles of sand-stone or lime-stone project through this gravelly covering. The valleys are broad and shallow, filled up apparently by the same debris, which is brought down by the slowly melting snow, and are nowhere cut into deep channels and ravines as is generally the case in Ladakh.

North of this range is the first of the vast lake plains traversed in the route to the Karákásh.

Description of the 1st lake plains lying north of the eastern continuation of the Karakorum range of mountains.

It is about 20 miles across, north and south, and much wider in the direction east and west. It is bounded to the west by a

lofty range of rugged mountains with snow-clad peaks at a distance of of 20 miles. The region to the west of this range is totally unexplored, and no native seems ever to have visited it; but I have little doubt that by a careful examination a much easier way could be discovered to Yarkund than that by the Karakash.

The mountains present deep gaps between the high peaks, so that there must be low easy passes, and once across the range one comes into the water-shed of the Yarkund river, along the course of which there is in all probability an easy route to Yarkund, or at least to the point where that river crosses the Karakorum route, north of the pass of that name. Should such a route be found it would save the discomfort and trouble of crossing the salt plains, and most likely prove the shortest and easiest way.

To the eastward the mountains are more distant, and generally appear lower, though they present some very high snowy peaks. The surface of the plain is generally a coarse sandy clay and gravel often covered with salsolaceous plants, chiefly a tufty *Eurotia*, with thick woody roots, which, even when quite fresh, burn very briskly, and are the only fuel procurable. This plant quite replaces the Tibetan furze call'd "*Dama*" a species of *Caragana*, which is found under similar conditions in Rupshú—Spití, &c., but seldom occurs north of the Indus. Were it not for this plant these regions would be almost impassable for want of fuel. It is called in Tibetan "*Gapshen*," and there are two varieties of the plant, which is found in almost all situations, on the dry sandy plains and on the barren mountain slopes, between the Indus and the Karákásh rivers.

Another plant of the Umbelliferous order, an *Aster*, called by the natives "*Palu*," and which is used by the Lamas for incense, is also found in many places in these regions. It too grows in spreading tufts, and has dry woody roots, which burn well, but the roots are too thin to be of much use for fuel.

Flora of this tract.

A considerable extent of the surface of this plain is composed of a bed of fine lacustrine clay, sometimes rising in low cliffs and ridges, containing

Geological formation.

regular strata of dry water-weeds, resembling those at Pangong lake. I could find, however, no traces of shells or fossils. In this plain I saw two large lakes, one close to the northern edge, called Tso-thang—before mentioned; the other a few miles further south. There are also said to be some larger lakes to the eastward. The level of the plain is about 17,000 feet above the sea. Antelopes are seen in great abundance on the plain, and a few kyang (wild horse); they feed on the young shoots of the *Eurotia*.

The ranges of mountain north of this plain are in great part composed of slate rocks, but the lofty craggy ridges in the centre are chiefly of lime-stone, sand-stone and quartz. The spurs running down to the northwards are generally of clay slate of variegated colours, arranged in thin brittle flakes, and the strata much contorted. The saline springs and efflorescence seem to be almost always connected with this particular formation. In this range are numerous antelope, kyang, and wild yák. I also observed traces of wolves. The only birds I saw were a few ravens and mountain finches, but I found the remains of a deserted eagle's nest, which contained many hundred antelopes' horns, several horses' shoes, and other strange articles.

The second plain north-east of this range is about 16,000 feet above the sea. It stretches far away to the north-east and east, but is broken up by low ranges of hills. It contains numerous salt lakes, and the surface is over a considerable extent deeply covered with saline matter.

About a mile from the halting place called Thaldat is one of these lakes, the northern part of which is all salt water; but the southern half forms a lake of frozen snow lying out in the open

General aspect of the mountain range north of the 1st lake plain.

Altitude of the 2nd lake plain.

Lake at Thaldat consists in northern part of salt water, while the southern half is frozen snow.

plain, and nearly two miles from the nearest hills, which themselves were quite bare of snow on the 15th July.

This snow lake was about 2 miles long, $1\frac{1}{2}$ broad, and 8 or 10 feet deep, with a few inches of clear water running below the snow. On crossing it I could see in the fissures and crevices, that, a foot or two below the surface, the snow was frozen into semi-transparent green ice exactly resembling glacier ice. It is in fact a glacier out in an open plain and not fed by snow mountains. I imagine that in winter an immense drift of snow is heaped up against the hills to the south by driving north winds, and that this lake or hollow is filled with such an accumulation that it does not melt in

the short summer of these regions. Northwest of this plain, and separated from it by a range of mountains which we crossed by a low pass, is a third plain of a similar character, also containing several salt lakes. The northern half is covered to a depth of several feet with

Remarks on unusual saline efflorescence on this plain drifting about in high wind like dust, and the glare producing effects like snow blindness.

saline matter, soft, white and powdery on the surface but hard and crystalline below. The surface is often rough like the waves of the sea, rising up in ridges of solid salt 6 and 8 feet high, and sinking into hollows of the same depth. With the afternoon winds this salt was blown up in driving clouds, like dust-storms in the plains of India, which combined with the hot sun and cold dry air were most irritating to the skin and eyes. The glare from the surface also was very trying, and produced effects like snow-blindness. I observed the Tartar coolies make what to me was a novel use of their pigtails. They unplaited them and tied them across their eyes to protect them from the glare. This plain continues uninterruptedly to the valley at the head of the Karakash, without any intervening

mountain range, though in the latest survey map* a ridge is made
 4th lake plain described. to cross it nearly in the middle. West of this
 plain, but separated from it by a rugged mountain ridge, is a fourth
 plain of like nature and containing a large salt lake. Into this
 we were conducted by the mistake of the guide, who promised a
 short cut across the mountain. On reaching the fourth plain we
 discovered our error, and had to return over the intervening range,
 and at nightfall found ourselves on the side of the rough field of
 salt already mentioned, and had to encamp without fuel or water,
 and consequently without food; the next morning had a march of
 10 miles over the salt before we reached water. The thermometer
 in the morning stood at $4^{\circ} F.$ or 28° below freezing point. At its
 northern extremity the third plain ends in the Lungding valley,
 which after 4 or 5 miles suddenly dips down by a narrow sandy
 ravine to the Karakash river, which is here about 15,500 feet
 high. Its source is in some glaciers and snow
 fields among high granite peaks to the north-
 cast. These plains have all evidently once been vast lakes, prob-
 ably of fresh water, and draining into the Karakash river. On
 the sides of the surrounding hills up to a height of 150 feet are
 seen old beaches rising in regular terraces. The mountains round
 are chiefly slaty, with peaks of granite and other igneous rocks.

The Karakash river, and
 its source and altitude.

Appearance of mountains
 north of the Karakash river.

resembling the brittle granite of Ladák.
 South of the river slate rocks prevail. Over

* The arrangement of these mountains in this map is incorrect. The dark ridge marked as running nearly east and west in latitude $35^{\circ} 33'$ and $34'$ and east longitude $79^{\circ} 20'$ to $30'$ does not exist in this direction. This ridge in reality runs nearly due north, and separates the "salt lake" south of the "encampment Karakash" (of map) from the larger "salt lake" to the south west; and in the situation that this range is made to occupy in the map there is what I have described as the third salt plain, an immense level expanse, 20 miles long north and south and from 5 to 15 or 16 miles across in the opposite direction, and containing 4 or 5 salt lakes. It is separated by the range I have just noticed as lying nearly north and south from the fourth salt plain.

all these regions antelope are common, and near the Karakash I saw kyang, and traces of wild yák (Droug) also a few hares, brahmini ducks, and a species of snipe.

Over the salt plains there is little or no vegetation, except the *Eurotia*, and even this does not grow where there is much salt; but amongst the mountains between the two first plains some *Artemisiæ* and the *Eurotia* were plentiful; here too the slopes were clothed with grass, (*Carex*), and many flowers, chiefly *Primulæ*, a *Ranunculus* and *Saxifrage*, and a very handsome yellow *Ligularia* grew along the sides of the springs. At the head of the Karakash the ground was* carpeted with bright flowers. A yellow *Primula*, the *Androsace*, grew in wide patches. Two or three species of *Saussurea*, some small *Cruciferae*, a blue *Nepeta*, a leguminous plant not in flower, *Saxifrages*, and several other plants besides the *Eurotia* were common, but there were no shrubs or vegetation of larger growth.

10. With regard to climate, the most striking points are the extreme dryness, and the extremes of heat and cold. In Changchenmoo valley on July 9th at a height of 17,000 feet above the sea, the thermometer was 31° at sunrise, 75° at noon in a tent, and 212° (a black bulb sun thermometer) in the sun's rays. On the 25th July in the same place it only sunk to 40° at sun-rise.

On the first plain, on July 13th and 14th the thermometer at sunrise was 10° and 13°. July 22nd on the same plain it was 19° at sunrise.

On the third salt plain (elevation 16,000 feet) the thermometer on July 18th stood at 4° at sunrise.

Salt plains have little or no vegetation. Flora of mountains between these plains.

Remarks on climate of the route traversed.

Temperature of first salt plain.

Temperature and elevation of the third plain.

At Lungding near the Karakash on July 19th and 20th, the minimum temperature was 22° and 24° . It was evident that extreme nocturnal cold lasts the greater part of the year on these elevated plateaus, and it probably freezes every night. The cold was, however, decidedly less towards the end than at the beginning of July. On the evening of July 16th it began to snow, and continued nearly all night, and in the morning the whole plain was covered to the depth of an inch or two; this all disappeared in a few hours. Rain is probably unknown in these regions.

In the valley of the Karakash we seemed suddenly to enter a warmer climate, so great was the contrast after the open plains, and the more advanced state of the vegetation showed the same. In the day-time the heat of the sun was intense. I was forced to leave my sun thermometer in Changchenmoo, but I am sure that the sun was as hot on the northern plains as in that valley, where the thermometer rose to 212° (more than 30° above the boiling point of water). There can hardly be another country in the world where the thermometer rises from 4° to 212° in a few hours. The cold at night evidently accounts for vegetation being so scanty, even in places well supplied with water. All the lakes, fresh and salt, and generally the running streams, were partially frozen in the mornings.

Another point to be noticed in the climate was the constancy of the prevailing winds, and the regularity of the winds.

During the forenoon the wind was always light and uncertain, blowing more or less from the south. In the afternoon it veered round to the west and north-west and blew steadily, and by evening rose to almost a hurricane from the same quarter; three or four hours after sunset it fell again, and went round to

the north, and in the morning blew a gentle but cold air from the east. This occurred every day, but the further north we went the earlier in the afternoon the westerly wind rose and the greater was its violence.

I did not observe the almost cloudless skies of Ladák proper, but noticed that clouds blew up almost every afternoon and disappeared again during the night. This may have been accidental, as there has been more than the average of cloud this season in Ladák itself.

H. CAYLEY,
On Special Duty.

LADÁK, }
18th August 1868. }