

India. Survey of India dept.  
Trigonometrical Branch.

J. T. WALKER

# REPORT

ON

THE TRANS-HIMALAYAN EXPLORATIONS

IN CONNECTION WITH THE

## TRIGONOMETRICAL BRANCH, SURVEY OF INDIA,

IN EASTERN THIBET DURING 1878

AND

IN SOUTHEASTERN THIBET DURING 1875-76.

---

EXTRACTED FROM THE GENERAL REPORT ON THE OPERATIONS  
OF THE SURVEY OF INDIA FOR  
1878-79.

BY

MAJOR-GENERAL J. T. WALKER, C.B., R.E., F.R.S., &c.,  
SURVEYOR GENERAL OF INDIA.

---

Dehra Dun:

PRINTED AT THE OFFICE OF THE TRIGONOMETRICAL BRANCH, SURVEY OF INDIA.

M. J. O'CONNOR.

1879.

PRICE ONE RUPEE.



**Report by Lieut. H. J. Harman, R.E., Assist. Supdt., Survey of India, on the exploration, during 1878, in Eastern Thibet, of "G—m—n."**

In June 1878 I engaged G—m—n to give me instruction in the Thibetan language. He is a married man and a lama of the Pemiongehi monastery in Sikkim; he is a Sikkim Bhotca and is about 30 years of age—a good Hindustani scholar, said to be well read in his own language and Thibetan literature, has a smattering of English, understands English figures and simple accounts; has been employed as a Sirdar (head of a gang of coolies) in the Public Works Department and casually as Interpreter at the Court of Darjeeling; he has also travelled a little in the plains of India.

Finding that my studies seriously cut into my time, I gave up reading and took to teaching G—m—n a little surveying, he took to it very well, and as I found him to be very sharp and industrious, I gave him the offer of service as an explorer which he eagerly accepted. He soon learnt traversing with the Prismatic Compass, to plot his work, use the Boiling Point Thermometer, read a Hadley's Sextant, and understand maps. The rainy season of 1878 was very wet, and during 27 consecutive days G—m—n did not get a sight of the sun or stars.

2. I decided it was better for him to go to work with his imperfect knowledge than to lose a season. He was instructed to trace the Sanpo river from Chetang downwards as far as he was able. Also to make a circuit of the Yamdok Cho lake and give a good description of the iron chain bridge over the Sanpo river at Chaksamchori.

On the 6th of August 1878, he left Darjeeling and travelled by the Jelep pass to Phari and thence by the Yamdok Cho lake and the iron chain bridge to Lhasa. He did not make the circuit of the Yamdok Cho, but made some observations which will be found in para. 8. He gave an account of the bridge, which will be found in para. 9.

He spent considerable time at Lhasa and in the monasteries thereabouts, and spent a round sum in presents to high Lamas, in purchase of butter for burning at shrines, &c.

He went to Debung monastery and found it contained 9,800 Lamas, so that it has become the largest monastery in Thibet. He saw the great copper caldrons in which rice and tea are prepared for the Lamas; caldrons measuring 20 feet across and 6 feet deep, built up in masonry and with planks laid across, so that the cooks might easily stir up the contents and ladle them out.

He paid a visit to the Bell foundry and saw some large bells 2 feet high; very little work was going on.

He states that the rice from Bhutan, which is considered the best, is not allowed to be sold in the Bazaars to the general public but can only be sold to Lamas. Nepal rice is sold to the public, and is dearer than rice sold at Darjeeling, and the commonest kind of butter is very expensive.

He was very little troubled by rain, leaving it behind him at Phari, and getting it only at Rip village and Mimjong. Some snow fell at Chukorgye monastery and the Lungla pass, and the country between the monastery and the Cholamo lake was covered with snow. Near Rip village he entered an undulating country covered with low thorn bushes, so low that he could see about him in every direction but quite obscuring his line of route. From fear of robbers and of not turning out much work, he hurried over this piece of his route at undue speed, and some 8 or 9 of his bearings have had to be changed that his work might plot. He also kept the record on pieces of paper and did not make daily entries in his Field Book from these scraps of paper, according to the strict orders he received, but I have very carefully questioned him about this portion of the route and think it sufficiently trustworthy for geographical purposes.

His altitudes of the sun are very doubtful and his dates are wrong; as yet I have not been able to make any thing of the astronomical work.

He took very few Boiling Point observations, but they may be relied on; his value for Chetang agrees well with Nain Sing's determination. Altogether he did not do the amount of survey I expected from him, and on his return in January 1879 I dismissed him. His persistent declarations that he had done his best, distress at being sent adrift, and the probabilities of his traverse being correct from its fulfilment of the conditions required by D'Anville's map, and affording from its course the drainage areas which by recent discharge measurements of the rivers of Assam are required, led me to take the man on again and send him to Pundit Nain Sing at Almora for proper instruction in the use of the Sextant and his Survey duties. He prosecuted his studies with vigor and has gone away on a most important journey, guided by a Lama who has traversed the whole route G—m—n has to follow.

3. Starting work at Chetang in October 1878, he followed down the right bank of the river for  $1\frac{1}{2}$  miles and then crossed by boat to the left or N. bank of the river to the monastery of Ngáritasong (300 Lamas), fort of Takurjong and village of 40 houses. The Sanpo river at point of crossing flows in a wide sandy bed and the breadth of water is about

400 paces. For a distance of 100 paces the boat had to be rowed, the remainder of the passage was made by poling with poles 25 feet long; the current was very slight. The discharge of the river at the most moderate estimate would give on the above data about 15,000 cubic feet per second, which accords well with what would be deduced from Nain Sing's report.

At 10 miles from Chetang is the village of Jantong (80 houses) where a road comes in from Lhasa: it is a road for the Giaour Rimboche to travel to the small monastery of Densuti, which is 4 miles to north of G—m—n's route. The road is defined by two parallel rows of stones placed close together, marking the limits of the road.

At 14 miles from Chetang the route ascends for half a mile and the monastery of Chakurjong comes into sight: I would identify the name of this monastery with the name of the small river marked "Tehiacar" on D'Anville's map.

At 18½ miles from Chetang are the remains of a large fort and the small monastery of Sangri: I would identify the monastery with the "Sancri" of D'Anville's map.

At 30 miles from Chetang the route leaves the Sanpo and goes to the north.

At 40½ miles there strikes in a road from Lhasa, prepared for the Giaour Rimboche to pass along. About 2 miles further on, the Mik Chu stream (which rises in the Lungla pass) is crossed: I think this may be the small river marked on D'Anville's map.

At 44 miles, he met 300 Lamas returning to Ngáritasong monastery from a trip to the Chukorgye monastery.

At 54 miles he crossed the Lungla pass, the rise up to which was very gradual. The pass is high and there was snow lying all about. A moderate descent over 5½ miles took him to the Chukorgye monastery which contains 300 Lamas. Here he stayed and took a trip to the small lake of Cholamo, which is situated on very high ground about 8 miles from Chukorgye. Into this lake it is customary to throw rupees and white silk scarves. To the Giaour Rimboche this lake is of importance, for he can by looking into it foretell his death and new birth.

The large and fine fort of Gyatsa Jong and the Thakpo monastery are met with at 88 miles from Chetang: 2 miles further on, the route again meets the left bank of the Sanpo river. Just across the river is the meeting of 3 roads, one from Chetang, one to Tsári 7 days' journey, and a route to the Khombo district. Tala monastery is seen to north of the route at 101½ miles from Chetang, and the Tala Chu stream is crossed by a bridge 26 paces long. All the bridges over the streams are of the same pattern: the abutments are of stone and the chasm is spanned by beams one above the other, each one overlapping the one below till but a small gap remains in the middle which is covered by planks; the shore ends of the beams are weighted down with stones.

At 105½ miles is the small monastery of Paruchude where the Giaour Rimboche (a boy of 1½ years of age, and seen by G—m—n) was born. 150 Lamas have recently taken up their residence at Paruchude.

At 111 miles is Aru monastery of 60 Lamas and close by is a village of 21 houses.

A mile beyond Aru, he met with 5 Chinese journeying to Lhasa with loads of musk balls which they had collected in the Lepcha district to south of and near Tsári. Across the Sanpo is a road going south to the country where lead mines are worked: the district is 4 days off: it supplies Lhasa and all the surrounding country with lead; the people pay their revenue in lead.

At 120 miles, he again crossed the Sanpo to its right bank. The water has a breadth of about 250 paces, has a very slight current and is apparently very deep.

He now journeyed by the right bank of the river all the way to Gyala Sindong which is at 287 miles from Chetang. There are many ups and downs along the route, but the river is kept in sight nearly all the way.

At 123 miles is the large monastery of Thakpo Nongjong, the name of which I would identify with the name of the district "Taepou y" on D'Anville's map.

At 125 miles he crossed the Tsári Chu river which comes straight from Tsári only 2 days off to the south. I take Tsári to be the "Chai" of D'Anville. It is said to be not a large town, but there are many villages in its vicinity and plenty of bamboos and wood. 1½ days to south of Tsári is a country of wild tribes: the district is called Gimuchen, literally the "naked man country".

There is a rise of 5 miles on to the ridge called the Khombo-nga-la which forms the western boundary of the Khombo district and which I take to be the "Conc Pou y" of D'Anville. Khombo is the general name for Eastern Tibet. At 140 miles is the small monastery Kongkár Jong and a ruined fort.

On the 23rd October the Kimdong Chu river was crossed, it is rather large and flows in a wide bed. The bridge had been washed away, and the river being full the crossing was a matter of great difficulty and danger. 2 days' journey up this river is the town of Kimjong, distant 3 days from Tsári. Near the river is a low stone wall to mark the boundary between Kongtu (upper) and Kongme (lower) Khombo. At this place the Sanpo makes a great bend and turns to the north-east for a course of nearly a hundred miles.

At 171 miles the route enters an undulating country covered with low scrub, thorn

**jungle: habitations are very scarce.**

At 188½ miles he came to the large forts of Orong and Kacha whose Jongs (governors) were in charge of the adjacent tracts of country. Here he met many people whom he calls Lepchas. They are called Membo by the Tibetans, who give the same name to the Lepchas of Sikkim. In face, complexion and dress they are not distinguishable from the Sikkim Lepchas, but they do not speak the Krong language (that of the Sikkim Lepchas) but have a language of their own: an interpreter is kept for them at Orong. They pay tribute to Tibet, and are much esteemed for their truthfulness and straight forward dealing. They had come down the Lung Chu river, and said their country was 9 days' journey off and that it marches with Gimuchen the country of savages. They said they had many villages near the line of route from Chetang to Táwáng and Odálguri in Assam; a route traversed by Nain Sing and the explorer L—.

They call themselves Pakelátsirba and I would draw attention to the Desiri mountains and the town of "Dsiri" marked on D'Anville's map to the west of Tsári. A good number of men had come to Orong for trade and had brought with them valuable loads of musk balls, madder, pepper, and 'láshin', also numbers of cane and bamboo baskets of the fashion of the Sikkim kiltá or tapa, which is a basket resting on the back and held by a strap across the forehead. Nearly all the musk which is found at Lhasa comes from the Lepcha district, which also supplies most of the baskets found about Lhasa.

At 212 miles, across the Sanpo, is a road to Lhasa, said to be only 9 days' journey off, though there are 2 high ridges to cross. This is a most important statement, as it corroborates the accuracy of the survey up to this point.

At 215 miles he crossed the Naiupu Chu, a large river flowing in a sandy bed 500 paces wide. A short distance from the Sanpo it splits into three streams. Formerly the route used to cross these three streams but the bridges have been washed away.

The river takes its rise in the Naiuphula hills which are far away, but visible, to the south.

At Mimjong he stayed 2 days to question the savages who had come there for trade. They had come down the Naiupu Chu river and said their homes were 2 days' journey to south of the Naiuphula range. They are the people of Gimuchen. Madder, durry cloths and much Indian corn were brought for exchange with wool and iron. They would not receive cash payment. Occasionally, children and short witted men are brought for sale as slaves; for a woman they would get the equivalent of 60 Rupees. The practice of selling slaves is common among the Miris of the Subansiri valley. To G—m—n I showed some photographs of Hill Miris, and he affected to recognise a resemblance between them and the savages he met at Mimjong, also the long swords and plaited cane waist belts. At 226 miles is the village of Khomboding on the eastern boundary of the Khombo district.

An ascent of 6 miles takes one to the small village of Fuchu.

At 242½ miles is the important monastery of Chamna (500 Lamas). Across the river, on the left bank, is the monastery of Chamkar (400 Lamas), with villages in its neighbourhood and a road to Lhasa. I take this monastery to be the "Tchamca" of D'Anville, on account of the great bend in the river to the south which both G—m—n and D'Anville place just below "Tchamca." Before reaching Gyala Sindong, which is a large fort at 287 miles from Chetang, the ruins of many villages and forts were passed. At Gyala Sindong the snowy peak of Jungla bore 130°, the river passing through a gorge to west of it. G—m—n closed work at Gyala Sindong. The road continues on along the right bank of the river for 4 days and then crosses to the Poba or Lhoba country. The word "Poba" signifies a man of Bhutan, also independent. The country is peopled with all the outcast rogues and black sheep of Tibet; the inhabitants proper have a peculiar dialect and differ greatly from the Tibetans in costume and religious observances. They are bordered to the south by a country of savage tribes known as the Gimuchen country.

There is a road from Gyala Sindong into the Pemakou district, which is subject to Tibet. In it are many villages of Lepchas and people of Bhutan. I think this Pemakou may be the "Kenpou" of D'Anville. To Gyala Sindong G—m—n gives the height of 8,000 feet; so that the river has fallen 2,000 feet in its 250 miles of course from Chetang; most of the fall may occur in the unexplored bit of the river, beginning at 30 miles east of Chetang.

4. If the Sanpo be the Dihang branch of the Brahmaputra, then it has a fall of about 7,000 feet in about 160 miles, or 40 feet per mile, which is not a very great fall for Himalayan rivers.

G—m—n was told, that report had it, the river after flowing through the Gimuchen country entered a land ruled by the British. The Dihang river has at its mouth a discharge, at minimum level of the year, of 55,000 cubic feet per second, or 4 times that of the Subansiri river, and twice that of the Brahmakund branch of the Brahmaputra river. The wild tribes called "Abars" who live in the Dihang valley, trade with Assam and Tibet; the more wealthy among them wear Thibetan woollens. They say their river comes from the far north west, and our survey operations in Assam have shown there is a great gap in the snowy ranges through which the Dihang passes, and that thereabouts (to N. W. of the mouth of the Dihang) is much low lying country.

G—m—n states, that from Gyatsa Jong to Gyala Sindong the river is of very variable width and is in places very narrow; at Gyala Sindong it is but 150 paces wide though deep

and with moderate current. The flat and sandy nature of the bed in this part of its course may cause considerable filtration and G—m—n may not have noticed the places where it flows in more channels than one.

According to D'Anville's map, the Sanpo flows into the Subansiri, but according to G—m—n's exploration this can hardly be, the river would have to turn back on to itself and after draining a large tract of country and the very rainy district of the Miri Hills to north of latitude 28°, appear in latitude 28° with a discharge of but 9,000 cubic feet per second at minimum level of the year. Very agreeable results are found by turning it into the Dihang.

5. In the construction of my map I have considered that 2,000 paces cover one mile of route. The route traverses  $2\frac{1}{2}$ ° of longitude and there are many ups and downs along it, so that I think it would not be unfair to make some reduction in the longitudinal distance traversed and plot the fort of Gyala Sindong in longitude  $94^{\circ}$ . This adjustment would give the Sanpo below Gyala Sindong a more easterly course.

7. G—m—n returned to Darjeeling by the routes marked in the neighbourhood of latitude  $30^{\circ}$ : I have obtained from him very little information concerning them.

On his way back through Phari he found encamped there a large number of Thibetan soldiers, not less than 200: it was rumoured that 500 more soldiers were on their way to Phari from Shigatze, Giangze and Lhasa. One day when near Singlo monastery he met about 500 soldiers, mostly Chinese, on their way to re-inforce Lhasa; they were all mounted on ponies and travelling anyhow, singly and in groups: they had no arms with them. The demonstration at Phari had for its object the causing the Deb Rája of Bhutan to make some reparation for a number of excesses recently committed by his people in the Chumbi valley and elsewhere. I have been told the demonstration had the desired effect and the soldiers did not need to go to Tasisudou (the capital of Bhutan) as was thought might be necessary.

G—m—n describes Phari as a most desolate place, without any wood, situated in the midst of a vast plain, at 12,000 feet above sea level. The ascents and descents from Phari to Lhasa are very gradual and the route is extremely easy, an account which agrees with the statements of other explorers and the traveller Turner.

8. About the Yamdok Cho lake I had written in my report on the journey made by the explorer L—. in 1875. "It is at least 2 miles wide at Yárlchi (Yasi) and half a mile at "Demálung. The lake has no outlet yet the water is sweet and good. The eastern margin "of the western part of the lake borders a stretch of flat land from which rises a mass of "mountains culminating in a rounded peak called Tungchin, which is about 2,000 feet above "the lake. On the slopes of the mountain, herds of yak and sheep were grazing, and several "houses were seen in one of the valleys. The water of the lake does not surround the "Tungchin mountain making it an island as is represented on our maps, but the mass is "connected with the mainland by a wide isthmus covered with boulders, at about 10 miles "S.E. of Yasi."

The Yamdok Cho is the famous ring lake of "Palti" shown on D'Anville's map. Mr. Manning saw it in 1811, but did not know it was in the form of a ring. He said the water was very bad whereas Pundit Nain Sing, C.I.E., who visited it in 1866, reported the water to be perfectly fresh, and he also obtained the additional information that the lake had no outlet and it required 18 days to make the circuit of it. Starting from Nanganche Jong Tarjum (near the S.W. corner of the lake) G—m—n soon struck the lake and going along the western margin he journeyed northwards for 2 miles and noticed the water rapidly decreased in width. There he found it but 400 paces wide and the lake broken through by a gap at least a mile wide, covered with boulder stones: the general level of this causeway was raised but little above the level of the water of the lake.

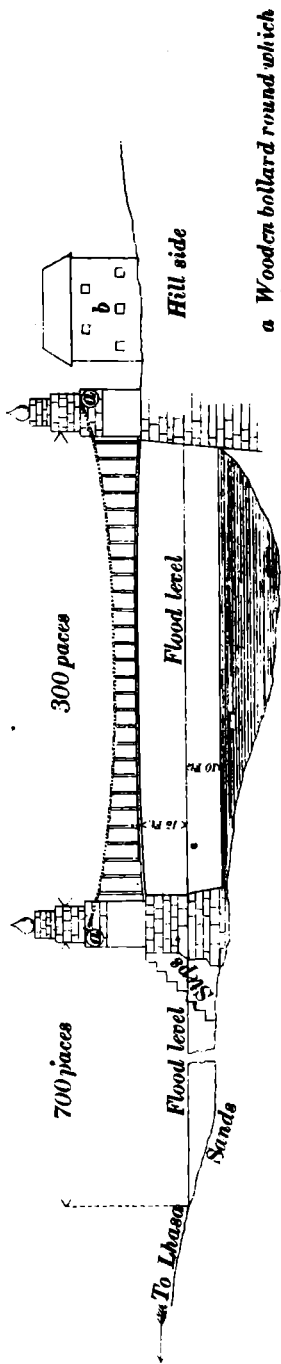
G—m—n describes the lake, between this break and the Khamba la pass, as a chain of lakes, the connecting links being often very narrow. He was told by a man who had made the circuit of the lake for "neko" (that is, the making a journey for cleansing from sin and sloth) that the circuit of the lake took 15 days, the eastern part of the lake was wide and the marches there were difficult. Thus the lake may be put down as having a circumference of 100 miles. The explorer L—. saw the lake in December 1875, G—m—n saw it in September 1878.

9. The great iron chain bridge over the Sanpo river, between the Yamdok Cho and Lhasa, is of the following construction.

The bridge is called Cházumtuka, the small monastery at south entrance to the bridge is called Cházumchori; in former accounts this has been written Chaksamchori.

The bridge is formed of 4 iron chains, 2 on each side. From the chains are suspenders of rope, carrying the footway which only allows of one passenger crossing at a time. During the rains the bridge is not in use on account of its northern end being separated from the shore by a wide stretch of water; then the river is crossed in boats. No toll is taken: the neighbouring villages support the monastery and maintain the bridge as payment of their revenue. The chains are stretched very tight and are fastened off by wrapping round huge bollards of wood built into the masonry of the piers. The width between the piers is 300 paces. The chains are formed of loops of iron a foot long, the diameter of the iron rod forming the loops is only one inch. G—m—n could obtain no history of the bridge; he thought it the most wonderful structure he had ever seen.

IRON CHAIN BRIDGE OF CHAZUMTUKA

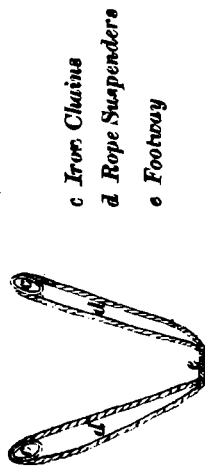


- a Wooden bollard round which the chains are wrapped
- b Chazumchovi Monastery

Links of Chains



Transverse Section of Bridge



- c Iron Chains
- d Rope Suspenders
- e Footway





## Report on Trans-Himalayan Explorations in South-Eastern Tibet, in 1875-76.

1. In March 1875 the explorer L—started from Darjeeling and carried a route survey through Sikkim *viá* the Tibetan frontier out-post of Gánpá Jong to Shigatze. From Shigatze he proceeded eastward along the banks of the Sángo or great river of Tibet, for about 50 miles, thence to the Yámdochho Lake, leaving which he reached the river again and traced its course down to Chetáng. From here he turned southward and endeavored to penetrate into Assam, but his progress was stopped at Mautángong (Tawáng) and he was compelled to return to Shigatze. Starting again from Shigatze he proceeded to Giángche Jong, and travelling thence *viá* Kálápángá, Phári, and Chhumbí (the summer residence of the Sikkim Rájá) he crossed the Jíliph Lá and returned to Darjeeling in July 1876.

2. His route survey was carried on by the usual methods of compass bearings and pacing, and was the first work of the kind ever undertaken by him independently. His instrumental equipment comprised a box-sextant, a watch, two pocket compasses, two boiling and two ordinary thermometers; of these on the present occasion he only used a compass, and the boiling thermometers for the approximate determination of heights.

3. The first part of his work from Darjeeling to Thángú, a village some 16 miles south of the Sikkim frontier, was over ground which had been traversed by Dr. Hooker in 1848-49; a map of Independent Sikkim by the latter\* shows all the country through which explorer L—travelled as far as the Kángrá-lámá Lá or Lásính pass. Thus there was a good check on this portion of L—'s work. The positions of Shigatze, Giángche Jong and Chetáng had been fixed by former explorations, and the routes followed by L—from Shigatze to Giángche Jong, and from Chetáng to Tawáng were the same as those traversed by the now well known Pundit Nain Sing in 1865 and 1874. Hence there were considerable portions of L—'s work which could be tested against explorations formerly made by a thoroughly experienced and reliable man, and thus a fair idea obtained by inference of the correctness of such portions of his work as had no intermediate checks.

4. Shortly after crossing the Kángrá-lámá Lá into Tibetan territory and when he had arrived within some 3 miles of Gánpá Jong, the explorer was taken prisoner by a party of horsemen and carried into the fort for examination into his business, destination, &c., by the Jong or Governor, who confined him in a house outside the fort, under a guard and detained him for about 15 days. Though not subjected to actual violence he was threatened and otherwise treated so as to cause him no little anxiety. Eventually he was sent on to Shigatze, where he was again questioned by the Governor, and at first told to present himself for his dismissal in 3 days time; but owing to the suspicions of one of his guard from Gánpá Jong it was subsequently determined to detain him until the arrival of a party of merchants who were shortly expected. He was compelled to remain in Shigatze altogether over five months, having a certain amount of liberty in wandering about the city and its environs, which he utilized by collecting information regarding the place, and the great monastery of Táshilumbo; but he was too narrowly watched to succeed in escaping as he wished to do. Finally, on the arrival of the expected merchants at the end of October, he contrived to secure their support, and so was allowed to proceed eastward.

5. Leaving Shigatze in November 1875, he travelled along the banks of the Sángo River for about 50 miles to Jagsá, between which place and the iron bridge over the river on the road to Lhásá at Chakh-jamchhurí there is said to be no road along the river bank, the river in this part of its course passing through rugged hilly country and falling over many rapids. From Jagsá he turned south-east, and then eastward again to Yási on the Yámdochho Lake. With regard to this lake, L—contradicts the hitherto accepted statement that it is a complete ring or circle of water surrounding the Tungehín Mountain; he states that this apparent island is connected with the mainland by a broad causeway, and that he saw flocks and herds grazing on the slopes of the mountain, and some houses in a valley. This statement is confirmed by a more recent explorer who visited the lake in 1878, and who, travelling along its margin, saw the connecting link, a broad isthmus covered with boulders, which he places some 10 miles S.E. of Yási.

6. From the lake, L—turned northwards again to the river Sángo, and followed its right bank down to Chetáng, where he remained some little time. Being warned that any further progress down the banks of the Sángo, unless in company with a strong body of men, would be attended with considerable danger from robbers and from the wild tribes along the route, he turned southward *viá* Karkaug with the intention of penetrating into Assam, through Tawáng, over the route taken by Pundit Nain Sing in 1874-75. On reaching Tawáng however he was seized and carried before the authorities, who refused to allow him to proceed any further southwards, and confined him for a month in the public flour-mill at Kiá-ká-rong, some 2 miles north of Tawáng; the only attempt he made at negotiating his own release being punished by the infliction of a fine. Eventually a mounted guard

\* In Volume 1, Hooker's Himalayan Journals.

was told off to escort him to Lháśá; but fortunately some informality in the documents carried by the guard induced an intermediate official, through whose hands he passed *en route*, to release him. Though thus set at liberty he despaired of success in any further attempt to reach Assam, and so made the best of his way back to Shigatze.

7. About the end of March 1876, the explorer succeeded in making arrangements at Shigatze to return to Darjeeling *via* Giángche Jong and Phári, to which latter place Captain Turner had travelled from Shigatze in 1783. He travelled in company with a party of merchants, and with the exception of men occasionally boldly demanding alms from them, they were unmolested till they reached Phári. Here however the explorer seems again to have fallen under suspicion; he was detained for a month, and probably matters would have gone very hard with him but for the kindly interference on his behalf of one of the leading men of the village, who obtained his release from the Chinese officials. From Phári he made his way across the Jilph Lá and reached the cart road from Darjeeling at Lindan. Travelling along this road he found the Commissioner of Darjeeling in camp at Kálingpung, and reported himself to him in July 1876, having been absent on his journey sixteen months.

8. Such portions of his work as could be compared against former explorations, proved fair, and the new ground traversed between Shigatze and Chetang, plotted between the positions of those two places as formerly determined, proved satisfactory. But on fitting in his route from Darjeeling to Shigatze on the known positions of those two places, sensible discrepancies appeared in the positions of points common to his work and Dr. Hooker's, which were difficult to reconcile. As the explorer had traversed the northern portion of this route, from Gánpá Jong to Shigatze, under the surveillance of a guard, it appeared probable that he could not have been able to take his bearings and count his paces with much care or exactitude, and hence it was suspected that the major portion of the error, apparent in his route from Darjeeling to Shigatze, would be found to lie between Gánpá Jong and Shigatze. However, as he could not with safety revisit the neighborhood of Gánpá Jong, it was considered expedient to send him out again as far north as the Kángra-lámá Lá, over the portion of his work common to himself and Dr. Hooker, to observe the latitudes of certain obligatory points, and to connect these points by short route surveys with the nearest hill tops whence bearings could be taken to trigonometrically fixed peaks.

9. Accordingly he left Darjeeling again on the 29th September 1877 with a pocket compass, a prismatic compass, and a 6-inch sextant; but on account of clouds and bad weather he was unable to take the preliminary bearings he had been instructed to observe until the 27th October. He then proceeded on his way to the Kángra-lámá Lá, observing for latitude at five points of his former route, and connecting two of these latitude stations by short route surveys with adjacent hill tops whence he took bearings to known peaks. He failed in connecting the other latitude stations by bearings in this manner with trigonometrically fixed peaks, owing to clouds and bad weather. The results of these observations satisfactorily demonstrated that the errors in his former route from Darjeeling to Shigatze lay chiefly in the portion north of Gánpá Jong, as had been suspected; and on replotting his work on the basis of his latitude observations, the points common to himself and Dr. Hooker agreed very fairly.

10. The explorer notes a strange and apparently unaccountable phenomenon connected with the Giamchana Lake. At intervals of from five to ten minutes a kind of explosion is heard, apparently proceeding from under water at some 40 yards distance from the shore. During the four hours he sat by the margin of the lake, these curious and inexplicable sounds were repeatedly heard: the sound was not sharp like the report of a gun, nor like the noise of falling rocks, but a dull, heavy concussion; the surface of the water was not in any way disturbed over the part whence the sound apparently proceeded. One of the men of the *chauki*, or guard house on the banks of the lake, told him that these sounds were caused by the breaking up of ice at the bottom of the lake. But on this hypothesis the fragments must necessarily have floated to the surface of the water; no ice however was visible on the lake except a fringe of shore ice along the margin.

### NARRATIVE of the Route Survey of L—Explorer, from Darjeeling to Shigatze, Chetang, and Tawang; and from Shigatze back to Darjeeling via Giangche Jong and Phari, in 1875-76.

1. Having taken latitude observations at Darjeeling, compared his thermometers, &c., Explorer L—, on the 29th March 1875, started from Darjeeling for Shigatze, with orders to proceed *via* the Tibetan frontier out-post of Gánpá Jong. The explorer had with him as companion a man well acquainted with the Tibetan language, but had considerable difficulty in procuring three men to serve him as coolies for the trip, as the route he had been instructed to take is supposed to be closed to all but Tibetan officials.

2. Starting work from the bench-mark in the middle of the Darjeeling bazár, he

Darjeeling to Thán-gú.

ascended to the bridge over the Rangit River, crossed it, and ascended to the village of Namjehiungmá in Sikkim territory. From this place his route to Thán-gú is over a line of country which had been traversed by Dr. Hooker, and is shown in his map of Independent Sikkim. In Namjehiungmá is a small monastery called Launge, occupied by 8 lámás; when any of these men wish to return to Tibet, or when others come thence to take their places, they are not permitted to travel *vid* Thán-gú and Gánpá Jong, but are obliged to go through Phári.

3. From this monastery the road ascends for about a mile and a half, and then runs nearly level for some 4 miles, through forest, passing close by a large cave which will afford shelter to 150 people; a descent of  $6\frac{1}{2}$  miles then took the explorer down to the right bank of the Teesta River. For 9 miles further, the road follows the bank of the river and is very easy as far as a cane bridge over the Teesta, across which goes a road to Phári; from this bridge the road, still keeping to the right bank, goes up about 4 miles to the crest of a mountain spur whence a descent of another 4 miles leads down again to the river; here is another cane bridge known as the Pasamjúblá, which is 60 paces in length, about 20 feet above the water, and not passable for baggage animals.

4. Crossing on the Pasamjúblá to the left bank, the road still keeps the general direction of the river, and about 3 miles from the bridge is the village of Dábiá whence a road leads across the range of mountains to the east into the Chhumbí Valley and to Phári. From Dábiá the road continues fairly level, and a few miles beyond it the Dulung monastery, where the Sikkim Rájá keeps his treasury, comes into view on the hills on the opposite bank of the river. Passing through splendid open forest and by several villages, the explorer reached the junction of the Láchlung and Lásính Rivers, which united, form the Teesta; the Lásính, the western branch, is apparently the larger of the two, and brings down the greater volume of water. Crossing the Láchlung to the village of Changtháng by a good wooden bridge well planked and covered with earth, another branch road was passed going off eastward along the right bank of the Láchlung and said to go to Giángche Jong. About a mile beyond Changtháng he reached the village of Rámá, and crossed the Lásính River by a cane bridge 60 paces in length and about 30 feet above the water. Four miles further on he crossed the Lásính by a wooden bridge about 25 paces long; and about a mile and a half beyond this, crossed a bridge on the road which is enveloped in the spray of the tributary stream which it spans, and which falls over the rocks above from an immense height, and sweeps under the bridge into the Lásính River close by with tremendous force. Six miles beyond this bridge is Lásính Chauki, a village of some 60 houses. Here reside a Tibetan and a Sikkim official who are called *Chipan*, and who guard the road and levy taxes on any merchandise which passes.

5. A party of six Tibetan merchants, returning from a trip to Calcutta with indigo, cutlery, cloth, and drinking cups, were found here; they had left Darjeeling a month before the explorer, but were detained here till instructions concerning them were received from Lhá-sá. The merchants had chosen this route on account of the low rate of the tolls; on the usual Phári route Rs. 30 per donkey load is charged for indigo, whereas at Lásính Chauki only Rs. 5 per load was charged. On the other hand however there was the objection against allowing any traffic on this route, except official, to be overcome, which had resulted in their detention. Between Lásính Chauki and Shigatze there is a small trade in madder and planks, yáks being employed for carriage. Lásính Chauki is about 7500 feet above sea level.

6. After a detention of 6 days the explorer was allowed to pass on; but he afterwards heard that the merchants were not released till a month later. From Lásính Chauki the road is still practically level for about  $4\frac{1}{2}$  miles to the village of Nínán, situated in an extensive plain; the houses were found full of property but deserted, no one being left in charge. Here ends the made road; beyond, the country is so easy and open that there is no necessity for expending labor on making a track. Crossing the Lásính to its left bank by a bridge at the village of Jámtong, a march of some  $6\frac{1}{2}$  miles took him to Thán-gú, which he reached on the 20th April 1875.

7. In the houses of Thán-gú were stores of grain and cooking utensils, all unguarded,

Thán-gú to Gánpá Jong.

the owners not intending to come up from their winter quarters at Lásính Chauki till the month of May. A mile and a half beyond Thán-gú is a wooden bridge over the Lásính,—here an inconsiderable stream, fordable though swift, its breadth only about 10 paces. Here all forest and jungle were left behind, and nothing was to be seen but a few stunted trees and occasional patches of grass bordering the small streams, till Rabgiáling village was reached, 100 miles from Thán-gú, and not far from Shigatze. From here also the road began to ascend steadily but gently, the slope not being more than  $5^\circ$ . Eleven miles from Thán-gú are the two Sarolá Lakes, separated from each other only by the road: the eastern one about a square mile in extent and rather deep, the western one somewhat smaller and shallow. Round about the lakes were patches of a small plant which yáks will eat, but which sheep and goats refuse to graze on; near the lakes are numbers of low, stone wall enclosures used as folds for sheep and oxen during the warm season when there is plenty of a sort of grass, the roots of which the animals eat. To the west of the road from Thán-gú to Sarolá are low hills, to the east a snowy range with a flat ridge. Through a gap in this ridge passes the road from the Sarolá Lakes to Tháchang Guupá, said to be 2 days' journey distant. On the road from Thán-gú

the explorer met a party of four men and a women carrying earthen vessels to Lásinh Chauki for sale; they said they had come from Giángche Jong by way of Tháchang Gumpá, and they warned our travellers not to go on to Gánpá Jong.

8. From the lakes the road continues to ascend for 6 miles to the summit of the pass, which is known by the various names of Sarolá, Lásinh Lá, Tháchang Lá, and Kángrá-lámá Lá: the low snowy range from the west dies out at the pass, and to the east of the road are extensive plains. The height of the pass is about 16,500 feet. On the summit of the pass, by the side of the road, are three small heaps of stones with a number of sticks about them, to which are tied bits of rag and paper with prayers written on them. These piles of stones mark the boundary between Tibet and Sikkim, and devout travellers never fail to make the circuit of them, hat in hand, muttering the usual formula of prayer. A mile and a half beyond the pass is a tiny lake; a mile beyond this again is a road going off eastward to Tháchang Gumpá: from here the road descends at a slope of about  $7^{\circ}$  for  $1\frac{1}{2}$  miles, and about 7 miles from the foot of the descent is the fort of Gánpá Jong, situated in the midst of an extensive plain. Scattered over this plain in little clusters are the tents of shepherds, part of whose duty it is to give warning at the fort of the approach of travellers. Every tent has its complement of large dogs which are chained up during the day and let loose at night to scour the country, and are very dangerous. When about 3 miles distant from the fort, three unarmed horsemen galloped up and ordered the explorer's party into Gánpá Jong for due enquiry into their business, &c.; shortly afterwards five horsemen armed with swords and guns (port fire) came and took them in charge and brought them before the *Jong* or Governor. He asked them a few questions and then assigned the explorers a house outside the fort, where two armed men mounted guard over them with their horses picketed close by, ready saddled and bridled.

9. The fort of Gánpá Jong is circular, about 1500 paces in circumference, and is built upon a small mound; the walls, 6 feet thick, are built of uncemented stones. In the middle of the fort is the entrance to a subterranean passage which leads to a small stream of water that washes the base of the mound on which the fort stands. The fort is used as a jail, and in it were confined some 50 prisoners, all for minor offences. The Jong is assisted by three *Nirpas* or writers, and every third day a runner is sent to Shigatze with letters.

10. On the second day after the arrival of the explorer and his party at Gánpá Jong, they were ordered to Lungdung, a village some 5 miles distant along the road to Shigatze, and here they were carefully watched, the men of their guard being changed thrice a day, the horses only once. Provisions were procurable at the following rates; *Chamba* or *Sattu*, a kind of barley, at six seers per rupee, Nepal rice at five seers per rupee, and a day's supply of fuel for an anna. The only fuel was dried yák's dung. Negotiations for their release proceeded slowly, and the explorer fell ill. On the fifteenth day of their confinement a *Nirpa* from the fort arrived and ordered them to proceed without delay to Shigatze, any carriage which they required being supplied to them.

11. From Lungdung the road traverses an extensive plain, and at 15 miles a road coming from the west from Singsoluhung joins it. Singsoluhung is said to be six marches distant, and to consist of two villages built on the slope of a hill, the upper one called Singso, and the lower Singsa. The road from Singsoluhung to Gumá is constantly travelled by Nepalese trading to Shigatze: Gumá is a village on the Shigatze road, 16 miles from Lungdung. At about 15 miles from Gumá the road ascends a moderate slope for half a mile to the summit of a pass called the Lásun Lá. From this pass 7 miles of slight descent leads to the Bhádúr plain, covered with villages and cultivation. The village of Bhádúr consists of 14 groups of houses, 3 to the east of the road and 11 to the west; each group contains about 30 houses. Through the middle of the valley a small stream flows gently to the west; the fields are irrigated and manured; the crops are principally peas and barley.

12. Six miles beyond Bhádúr is a monastery containing 500 lámás; there are 5 gilt bosses on the roof of the principal building. Nine miles further on is a slight ascent to the pass called Gámpo Lá where the road crosses a range of hills with peaks about 1000 feet above the level of the surrounding country: the descent on the other side is a mile and a half long, steep and stony; this is the only bit of road between Pasamjhlá on the Tcesta and Shigatze that would be difficult for a cart. In the plains lying at the foot of the slope, the explorer saw many herds of antelope. At the village of Rabgiáling is a plantation of dwarf *maznu* (willow) trees, the first trees met with since leaving Thángú. From Rabgiáling the road, passing the large villages of Lugri and Láchhung, meets the great road from Ladakh at the S.E. corner of the outer wall of the great Táshlumbo monastery which adjoins the Shigatze bazar. Shigatze is usually locally pronounced Jigárche.

13. The explorer arrived at Shigatze about the 15th May 1875, and soon after taking up his quarters at the *Tarjum* (or travellers' rest house and encamping ground) he was questioned by messengers from the Governor, news of his coming having preceded him. The explorer was taken before the Governor in the *Kachabri* of the fort, and, after some questioning, was told to come again in 3 days time. He thinks that he would speedily have obtained his dismissal, but for the suspicions of one of the *Nirpas* from Gánpá Jong, who was very troublesome. It was finally determined that he could not leave Shigatze till the arrival of certain traders whom the explorer said would probably recognize and vouch for him. On

one occasion he obtained 15 days leave to visit Giángche Jong, and intended making his escape on his way there; but he found himself so closely watched that he gave up the idea and returned to Shigatze. Finally, on the arrival of the expected traders, he succeeded in making arrangements through them; and at the end of October was told that he was at liberty to go where he pleased.

14. While the explorer was in Shigatze, information was brought in that the Lieutenant Governor of Bengal and the Commissioner of Darjeeling were in Sikkim and had reached the Chola pass. This news caused the greatest consternation; detachments of troops were sent off to all the Sikkim passes, and 13 companies of Tibetan soldiers from Lháśá with 10 mounted officers marched in to garrison Shigatze. Each company comprised 30 to 40 men. These troops were armed with swords, and a gun to every two men. The guns are very heavy; in action the muzzle is supported on two sticks which are hinged on to the woodwork under the barrel; one man places the butt against his shoulder and takes aim while another touches it off. The force had two buglers whose instruments were of brass, about 6 feet long, straight, and with a huge bell-shaped mouth, which was rested on the shoulder of another man whenever the bugler sounded.

15. Sometimes the soldiers went out for ball practice, having as a target a wall of considerable size; whenever the wall was struck by a bullet, a bugler concealed behind the wall blew a blast. On two or three occasions there were parades, at which the manœuvres were rather curious. Each company clustered round its officer in any way it pleased, and then they marched in a confused mass to the fort and disposed themselves in two bodies: one party enclosed a large circular area with a cloth screen about 3½ feet high and remained inside it as a defending force; the party outside forming the attacking force, surrounded the enclosure, and then both parties fired away at each other till their ammunition was exhausted. The towns-people appeared to take great interest in these evolutions, and also in the target practice. When the explorer first reached Shigatze there were only 100 soldiers in the fort.

16. The monastery of Táshilumbo contains 3,800 lámás. Its walls are 45 feet high, 5 feet thick, and built of large sundried bricks, the whole structure being whitewashed. The buildings are numerous and large, and many of the roofs are gilded. The bazar of Shigatze covers an area of 1200 paces by 1000, and contains, specially set apart, Kashmiri and Nepalese quarters. Quantities of newspapers come from Darjeeling, and most of the houses have their walls decorated with them. There is however very little traffic between Shigatze and Darjeeling *viâ* Gánpá Jong, notwithstanding the excellence of the road; during the 15 days the explorer was detained near Gánpá Jong not a single merchant passed.

17. In November 1875 he left Shigatze and again commenced work. Three and a

Shigatze to Yási.

half miles from Shigatze is the enclosed garden of Kunkyál-ing, 600 paces by 300, with a small lámásery situated in its midst; near the garden is a bridge over the Painá Chhu River, which is 80 paces in length, and constructed of large wooden beams resting on four large piers built of uncemented stones; the bridge is 4 paces wide and has no side rails. The banks of the river are moderately steep, the current gentle, and the water alive with large fish; during floods the river is said to rise 12 feet above the ordinary level. After crossing to the right bank of the Painá Chhu, the explorer followed it down for 2½ miles to its junction with the great river of Tibet called the Dugshum above the junction, and the Ekyáp Sàngpo below. He could not give any precise idea of the size or width of the river; in places it flows in several channels and in others spreads out into a great expanse of water with hardly any perceptible current. For 50 miles he travelled along the right bank of the Sàngpo to Jagsá, passing many villages on the road, and seeing others, and, at places, extensive cultivation some distance off inland. The banks of the river are shelving and the water probably never rises more than 6 feet above its mean level; the bed of the river is stony in places, but the stones are not large; there are large expanses of sand, and the current is slow. On the left or north bank many villages were seen; the margin of the river for a width of from 20 to 80 paces was bound in ice, but the river is said never to freeze over entirely. Sometimes the country is flooded in places, especially about the village of Taktúkhá, but the water does not go far inland.

18. There is a regularly organized goods and passenger traffic by boat down stream from Shigatze to Jagsá, divided into two stages at the village of Nimo, which is about 20 miles from the mouth of the Painá Chhu; the boats used are oblong in shape, flat-bottomed, and formed of leather stretched over a wooden framework. Arrived at the end of a stage, the boatman draws his boat on shore, dries it, and then carries it back on his shoulders to the upper end of the stage again.

19. The houses near the river have the lower 3 feet of their walls built of stone, while the upper portion is of unburnt brick; the houses are low, with sloping roofs covered with earth. Some of the houses cover a large area and contain many little rooms, each occupied by three or four persons; the windows are small openings with wooden gratings, and are few in number.

20. A plain varying from 3 to 5 miles in width stretches from the north bank of the river to the foot of a range of rounded hills about 1000 feet above the surrounding country; opposite Jagsá this range falls into the left bank of the river. A range of snow-clad hills closes in on to the right bank of the Sàngpo about 3 miles to the east of Jagsá, and there is said to be no road along this bank the river here entering the hills and falling over many rapids;

there is no boat traffic between Jagsá and the iron chain bridge of Chakh-jamechhurí over the Sápgo near Lháśá.

21. From Jagsá the road turns S. E. and enters the district of Rungchung; 5 miles from Jagsá is the village of Jámechen, and a monastery of 1500 lámás. The plain about Jámechen is studded with small villages. Beyond Jámechen is the monastery of Humídomá containing 900 lámás: from here the road runs through a fertile valley containing several villages, and about 13 miles from Humídomá is the village of Chhuchhen, (from *chhu*, water, and *chen*, warm) built on a mound from the base of which issues a small stream of water whose temperature is 152° F. The water issues in little jets and is conveyed by a short trough to a little pool in which the sick bathe. The water is not unpleasant to drink, but it has a bluish tinge and a strong sulphurous smell.

22. From Chhuchhen the road passes several villages, two small monasteries, a lake 400 paces long by 200 wide, and, at 26 miles from Chhuchhen, joins the road from Giángche Jong to Lháśá at the village of Yási on the margin of the Yámdochho Lake. The range of snow-covered hills overlooking the village of Jagsá on the east, continues on parallel with the road to the Yámdochho Lake; but it diminishes in height as it gets further from Jagsá. To the south of the road lie plains bounded by low hills which in places are close to the road, and in places are 4 or 5 miles distant.

23. Between Shigatze and Yási there is considerable traffic; the explorer met or passed 300 or 400 men with loads every day; for 3 days he travelled with some 30 Nepalese merchants on their way to Lháśá with cloth and brass vessels; and he met many Kashmiris returning from Lháśá with brick tea. A brick of tea, size about 9" by 4" by 2", rarely costs more than ten annas; it is composed of large, coarse leaves and stalks which have undergone very little manufacture. The orthodox method of preparing the liquor is to pound the tea to powder and boil it with a sprinkling of salt; when boiled it is poured into a long wooden cylinder, a lump of butter added, and the mixture thoroughly churned; it is then reheated over the fire before drinking.

24. From Yási the road traverses the western margin of the Yámdochho Lake for 17 miles, as far as the village of Dámálung; here the road leaves the lake and, turning northwards, crosses the range of hills, bordering the lake on the north, by the Khamba Lá. There are two roads up the ascent; the one for horse traffic is easy, and a little more than half a mile in length.

Yási to Chetáng.

25. The Yámdochho Lake is at least 2 miles wide opposite Yási; at Dámálung its width does not exceed half a mile. The eastern shore, visible from between Yási and Dámálung, is an expanse of flat land, from which rises a mass of mountains culminating in a rounded peak called Tungchín, which attains an elevation of about 2,000 feet above the level of the lake, the latter being about 13,700 feet above sea level. On the slopes of this mountain the explorer saw herds of yák and sheep grazing, and in a valley he noticed several houses. He was informed that the lake has no outlet, and that it does not (as hitherto supposed) completely surround the Tungchín Mountain; for the flocks of yák, sheep, and goats which graze on the slopes of that mountain can get on it without crossing water. A path at the south end of the lake, branching off from the road between Giángche Jong and Yási, 9 or 10 miles from Yási, is said to lead across a wide expanse of boulders and big stones to the mountain. As however, no traveller has yet been round the lake the accuracy of the above report remains in some little doubt.

26. From the Khamba Lá there is an easy descent of about 5½ miles, and some 4 miles further the village of Jámá on the right bank of the Sápgo is reached. Here the road divides, one branch going N.E. to Lháśá, crossing the Sápgo by the Chakh-jamechhurí iron bridge, 3 miles from Jámá; the other continuing eastward down the river. The explorer having been ordered not to go to Lháśá, took the eastern branch of the road, skirting the southern base of an isolated mountain about 1500 feet high, situated between the fork of the two roads, and 6 miles from Jámá, came again close on to the right bank of the Sápgo. Following the bank for 4 miles, he reached Kukhang village, protected by a fort, and containing a monastery with 1500 lámás. The fort, 800 paces in circumference, is on the bank of the river; its walls are 30 feet high, of rough uncemented stone; the garrison consisted of 7 or 8 soldiers only, as a guard for the Governor.

27. From Kukhang the road passes through many villages, one of which, Dáchang-rángmit, contains at least 250 houses. Seventeen miles from Kukhang is the fort, monastery, village and large bazár of Kirtjüng. This fort is 600 paces in circumference; its walls, 15 feet high, are in ruins in many places. In none of these so-called forts are the walls loopholed or creullated, or any means supplied to promote an effective fire: the defenceless state of these enclosures may be due to political reasons.

28. Between Jámá and Kirtjüng there are many great expanses of sand in the bed of the Sápgo. The plain bordering the north bank of the river is from 2 to 5 miles in width, full of villages, and bounded on the north by a range of low hills culminating in the fine peak of Dujethá, to the north-east of the village of Kirtjüng, about 3000 feet above the river. The plain to the south of the road varies from 2 to 5 miles in breadth, bounded by low, rounded hills which are uninhabited.

29. Fifteen miles from Kirtjüng is the village of Jhánpáling containing 300 houses, and a mile beyond the village is a monastery with 700 lámás. Nine miles from Jhán-

páling, but on the left bank of the Sángo, is the famous monastery of Samyá which contains 1400 lámás. The buildings in this monastery are large and very lofty, many of the roofs being gilt, and it is a renowned place for pilgrimage. The road continues along the right bank of the Sángo through plain country, and 40 miles from Jháupáling enters the bazár of Chetáng, a mass of buildings covering an area of 600 paces by 400. A daily open-air market is held here which is well supplied; and here also may be purchased goods of all kinds from Calcutta, China, Kashmir, and Nepál; this bazár is also famous for the sale of perfumed sticks ("Joss-sticks") that are burnt in the temples. In the monastery at Chetáng there are 700 lámás; it is 700 paces in circumference. The explorer always followed the Tibetan custom of making the circuit of a monastery, hat in hand. He saw various curious methods of making the circuit adopted by the Tibetans, some walking round on their knees, and others laying off the length of the body fully extended on the ground successively till the circuit was completed, even if it took them all day to get round thus. The fort of Chetáng is a little way out of the town, and is in the same partly ruinous condition as the other forts before mentioned. It is about 600 paces in circumference, and has a garrison of about 40 men.

30. At Chetáng low hills come close down to the south bank of the Sángo; the hills bordering the plain on the north bank of the river are also low. From here the river was seen trending away to the horizon about east by north in a wide valley, the view down which was bounded by a snowy range apparently a great distance off. The explorer was told that after flowing in this direction for 15 marches the river turned south, and, passing through a wild mountainous region, entered a country governed by the English. This accords with the generally received opinion that the Sángo enters Assam as the Dihang River, flowing into the Brahmaputra 12 miles below the frontier station of Sadiya.

31. The road continues along the right bank of the Sángo past Chetáng, but the officials warned the explorer against going along it unless he accompanied a strong body of merchants; for it is beset by thieves, and there are wild turbulent tribes armed with bows and arrows to be met with near Chári.

32. After remaining in Chetáng 6 days, the explorer, thinking he might run short of funds, left about the middle of December 1875, and turned southwards, intending to follow the route of Nain Sing into Assam. For some 13 miles from Chetáng the country is fertile and there are many villages along the road; but thence the country becomes bleak and barren. He probably took the alternative route from Chetáng to Tángshokh (Tángshú) mentioned by Nain Sing in his itinerary as passing through uninhabited country and used by traders from the Hor district. Twenty-seven miles from Chetáng he passed the two monasteries and village of Dhakyáling: snow-capped mountains here close in on to the road which ascends for 3 miles to the Yánto Lá pass, (16,300 feet) on which there is a frozen lake 300 paces in circumference. Three miles of easy descent and the road enters upon great, bleak, stony and barren plains. Seven miles from the pass is Karkang where is a house for travellers, and a small monastery containing 6 lámás. Karkang is at the trijunction of the districts of Chetáng, Photáng, and Niá. Here he met a small party of merchants going to Lhása with loads of tea, salt, and rice, carried on donkeys and horses: these were the first travellers met with since leaving Dhakyáling. Beyond Karkang the country is very bleak and desolate; the plain through which the road passes varies in width from 1 to 10 miles, and is bordered by low undulating hills. Thirteen miles beyond Karkang is Giárok, where are a few houses and some fields. Three miles beyond Giárok is a road going south-west to Niá, which is distant 8 miles from the bifurcation of the roads. The explorer visited this place on his return journey from Tawáng: he found there a fort, 500 paces in circumference, built on a small eminence, with many villages scattered about on the surrounding plain.

33. Twenty-one miles from Giárok is the small village of Sumná, and 4½ miles further a small stream, frozen over when crossed, draining to the south, crosses the road. From here the road ascends for 3 miles and then descends for a mile to a great lake\*, 6 miles long by 4 wide, west of the road, which was frozen half over. The lake is bordered by low rounded hills, and several miles off to the east is a lofty range: near the lake is much short grass, and herds of antelope and wild asses (the *kyáng* of Ladakh, called *thá* in Tibet) were seen. Three miles beyond the lake is the Tángshokh† guard-house, and a large house for travellers. To the east and west, 10 miles distant, are ranges of snow-clad hills. Fourteen miles from Tángshokh is Chhuiná‡, where there is a large bazár, a monastery, and a detachment of mounted soldiers. In the bazár are the shops of 5 Nepalese who have married Tibetan women and settled at Chhuiná. The monastery is at the south end of the bazár; it is 700 paces in circumference and contains 120 lámás. The detachment of soldiers numbers 25 strong only; they are armed, some with spears and long straight swords, others with guns and swords. Chhuiná is situated in a large plain, 5 miles long by 4 broad, surrounded on three sides by low hills; there are several villages scattered over the plain, containing altogether not less than 500 houses. There is very little cultivation however, only a few small patches on the banks of the stream, the place being chiefly a trading mart. There are several

\* The Nára Yumcho of Nain Sing.

† Tángshú of Nain Sing.

‡ Choua Jong of Nain Sing: for a fuller account of this place, see report on Nain Sing's Explorations in 1874-75.

springs of warm water, colorless and almost inodorous, from which the inhabitants take their drinking water. Chhuiná is about 12,900 feet above sea level.

34. A mile and a half beyond Chhuiná the road ascends for a mile, and another road branches off to the south-west which is said to go to a considerable place called Lubruk, near a large river. Nineteen miles from Chhuiná the road descends 2 miles and reaches the toll-house at Chhukháng, where a tax of three annas is levied on each traveller. Passing Chhukháng the road undulates a good deal, and the slopes of the hills are covered with trees like chestnut trees; ten miles off to the east of the road are visible great snowy peaks. Eight miles from Chhukháng is a small lake, 700 paces in circumference, which was frozen over. A mile beyond this lake the road enters a forest of gigantic trees, like deodár, of a greater height and girth than the explorer had ever seen elsewhere, and then goes down a continuous and moderately steep descent for about 5 miles to the important Tibetan post of Mautángong, or Tawáng. About 300 houses are scattered round about Tawáng, and there is heavy *ringál* (dwarf bamboo) jungle about the place, which is situated on a broad spur sloping to the south; a mile or so further down the slope is said to be the village of Mau situated on the boundary line between Tibet and the *Dhukpá* country or Bhotán. There is a Tibetan regiment 500 strong, quartered at Mautángong, commanded by 3 officers who also exercise civil functions. There are barracks for the soldiers, but no fort. There is also a large monastery\*, 1000 paces in circumference, containing about 700 lámás; several of the buildings in this monastery have gilt roofs.

35. At Mautángong the explorer and his party were seized and taken before the authorities, who were inexorable in refusing to permit them to pass on, and sent them back to be confined in the public flour-mill at Kiákárong, 2 miles away; here they were detained a month, the only attempt at negotiations which they made resulting in a fine being inflicted on them. A party of some 300 traders from Tibet were also in Mautángong. They had intended going to a place they called "Giagarjámsetung" in British territory, but permission to proceed had been refused by the authorities. Two young men amongst them one day spoke their minds too freely on the subject of such arbitrary detention, and they were promptly placed in the guard-house, and their goods sold by public auction.

36. In the mill in which the explorer was confined, the lower mill-stone was circular, about 5 feet in diameter, and fixed; the upper one was rectangular, and revolved thus:—through the centre of the lower mill-stone a spindle, fixed in the upper stone, passed loosely; to the lower end of this spindle, some 3 feet below the stone, were fixed a number of flat boards radiating like the spokes of a wheel, thus making a horizontal water-wheel against which a small stream was conducted, and so caused the rotation of the upper mill-stone.

37. At length three mounted soldiers were told off to escort the explorer and also the two insubordinate Tibetan merchants to Lhásá. Fortunately however, before they got to Lhásá, the governor of a fort on the road objected to some informality in the document carried by the soldiers and ordered them to return to Mautángong, informing the prisoners they might go about their business. The explorer therefore made the best of his way back to Shigatze by the route he had come. The explorer suffered much from extreme cold and high winds on his journey from Chetáng to Mautángong and back thence to Shigatze. The aspect of the country between Chetáng and Mautángong he describes as very bleak and desolate.

38. With regard to the climate and weather at Shigatze, he states that during the month of May no rain fell, though the sky was cloudy. The rain set in about the middle of June, and there was a good deal of rain during the months of July and August: the prevailing wind was from the east. In September there was little rain, but it was very cloudy. In October there was no rain, and strong winds from the east set in, commencing regularly at 11 A.M., rising to their height about 2 P.M., and gradually declining till about 5 P.M., when they ceased: they rarely blew at night. These winds were extremely cold, and in December and January they increased to such tremendous violence that for three or four hours in the day, while they were at their height, no one stirred abroad as it was impossible to travel in them.

39. About the end of March 1876, the explorer completed his arrangements at Shigatze for returning to Darjeeling by travelling in the

Shigatze to Phári.

foot-steps of Captain Turner, who in 1783 went from Shigatze to Phári: from Phári the explorer intended taking the road over the Jilíph Lá to Darjeeling. From Shigatze he followed the same route as that taken by Nain Sing in 1866-67, as far as the bridge over the Painá Chhu at Painá Jong; but from there he kept to the left bank of the river. Some distance beyond Painá Jong, the hills come down close to the road, and there is one large and very steep hill called Kurírádón overhanging the river, which is famed as the haunt of robbers, whose mode of attack is to sling down stones at the solitary traveller, who drops his load to escape across the river. The explorer travelled in company with 14 or 15 merchants, and except that several men came up and boldly demanded alms, they were not molested. A mile from this hill is the monastery of Nurbugiángchá containing 300 lámás. Passing several villages and water-mills, they came to Cháchín monastery, 2000 paces in circumference, and containing 1000 lámás. Three miles further on

\* For a full account of this monastery, and the large territorial jurisdiction and political influence held by it, see report on Nain Sing's Explorations in 1874-76.



is Manilágong village, and a bridge across the river; the bridge is 100 paces long and is supported on 5 stone piers; the river here is very swift. Half a mile from the bridge, on the right bank of the river, is the important town of Giángche Jong. The bazar covers a space of 600 paces by 300; the fort is large and built on an isolated mass of rocks overlooking the town; its walls are at least 40 feet high, but are in a ruinous condition in places.

40. From Giángche Jong a remarkable cluster of 8 needle-shaped peaks was noticed, bearing S.W., distant about 10 miles, and perhaps 3000 feet above the level of the river. After a stay of a couple of days at Giángche Jong, the explorer returned to Manilágong and travelled along the left bank of the Painá Chhu 11 miles, to Changrá. Four or five miles east of Changrá are lofty snowy mountains; the hills bordering the west of the road are low and rounded.

41. From Changrá he left the Painá Chhu river and turned up the bed of a small stream flowing in a narrow valley bordered by low, rounded, sterile hills. Twelve miles up this stream he came upon a shallow pool of warm water in the rocks; the water had a blue tinge and slightly sulphurous smell; the outflow from the pool was very small. Eleven miles further on is Sálu village of 50 houses, with some cultivation about it. The road here is bordered by low hills of a reddish kind of gravel. Five miles beyond Sálu is the large village of Píka, and 4 miles beyond this again is the Kálápángá or Kalochhu Lake; the road passing along its margin for 2 miles to the village of Kálápángá. This lake is about 2 miles broad, and the villagers of Kálápángá are great fishermen, going out on the lake in their little leathern boats and fishing with line and hook baited with paste; they catch numbers of large fish, which are dried in the sun. About Kálápángá there is extensive cultivation irrigated by several small hill streams. Five miles beyond is the village of Chhálu on the banks of the small stream flowing from the Rámchho into the Kálápángá Lake. A mile from Chhálu the stream opens out into a chain of small lakes, and at 6 miles from Chhálu joins the Ráza-chho Lake lying to the east of the road. The explorer did not obtain any other name for this lake. The road crosses the little stream near its issue from the lake on a small bridge built on 2 stone piers.

42. The road now enters extensive plains, and at 19 miles from the Rámchho Lake it reaches the village of Thuná, situated about 12 miles N.N.W. of the great snowy peak of Chumalári (or "Phári-Jumnu" as the explorer gives the local name) 23,900 feet high. Eleven miles beyond Thuná the road commences to descend a slight incline for 4 miles to the village of Chukýá; and 2 miles from Chukýá, in the midst of a large plain, stands the fort and small town of Phári, from which place a road leads off about north-east into Bhotán.

43. The fort at Phári is 1500 paces round, and its walls, built as usual of rubble stone, are 30 feet high. There are no fields or cultivation about Phári; the inhabitants of the 60 or 70 houses, which form the town surrounding the fort, own large herds of sheep and yáks, and employ themselves exclusively in the carrying trade. *Sattu* and *áta* (barley and wheat flour) are imported from Giángche Jong, and rice from Bhotán; their own flocks supply them with meat.

44. At Phári there are 3 Chinese officials and 30 mounted soldiers. The explorer was arrested here, and detained a month; and matters would have gone hard with him but for the kindly interference of one of the leading men of the village, who eventually procured his release. Leaving Phári, at 5 miles from it, he crossed to the right bank of a small stream, the Ammochhu, and entered a great forest. From here the road descends a slight incline for 7 miles, and 12 miles from Phári it again crosses the river Ammochhu to its left bank; here the stream is not fordable. Five miles beyond the bridge by which he crossed he emerged from the forest and reached the village of Kálíká which belongs to the country of *Dumu* or Sikkim. From here the road descends a slight incline for 4 miles, and at 5 miles from Kálíká is Chhumbí, the summer residence of the Sikkim Rájá. All the houses in this village are roofed with planks; the Rájá's palace is not large but the roof is handsomely gilt. There is also a small monastery here. A bridge 30 paces in length spans the Ammochhu River, and crossing this, 4 miles down the stream, the explorer came to Ringjinggáon, the houses in which are all very large, and are roofed with planks. At Ringjinggáon he left the Ammochhu, and, turning westerly and then in a southerly direction, entered a forest of huge *chir* pine trees, the road ascending continually but with an easy slope to a small lake, 300 paces in circumference, on the summit of the Jilíph Lá Pass. Snow was lying on the peaks along the ridge when he crossed this pass.

45. Descending from the pass for about 3 miles the road winds along the mountain sides for 15 miles, fairly level. Thence ensues a steep descent for 9 miles, the most difficult piece of road the explorer had passed over since he left Darjeeling, but yet practicable for laden horses; from Shigatze to this descent the road is extremely easy, presenting absolutely no physical difficulties, but on portions of it, north of Phári, fodder for baggage animals is scarce. Two miles from the foot of the steep descent he struck the new cart road from Darjeeling to the Jilíph Lá at a place called Lindam; here he picked up the cover of an official letter and was delighted to find that he had got safely back to India.

46. From Lindam he followed the cart road towards Darjeeling, and shortly reached the camp of the Deputy Commissioner of Darjeeling, at Kálingnung; this was in July 1876, and as he had left Darjeeling in March 1875, he had been absent from British territory for one year and four months.

## Narrative of the Second Expedition of Explorer L—, in 1877.

The object of the second expedition of the explorer over portion of the ground which he had traversed in his first journey has already been explained in para 8 of the Introduction to his former narrative. He was ordered to proceed to the Kánggrá-lámá Lá and to determine its latitude and that of several other points on his former route. His instructions were to visit first the G. T. Station of Senchal situated not far from Darjeeling, in order to find and recognize a number of trigonometrically fixed peaks in the neighborhood of his former route, the bearings of which from Senchal H. S. were given him. He was then to resurvey the small portion of his route from Darjeeling to the Rangit, and thence to proceed to Patam for his first latitude observations. After taking bearings to all visible fixed peaks from the nearest hill top, and connecting that hill top by a short route survey with the place where he had observed latitude, he was directed to proceed to Chaughthang village and thence to the Kánggrá-lámá Lá to observe their latitudes and check their positions by bearings as before. In the case of his failing to reach the Kánggrá-lámá Lá, on account of snow, he was directed to take his northernmost latitude observations at the Sarolá Lakes, and to carry a route survey from there to Darjeeling again *viâ* Phárá.

The explorer left Darjeeling on the 29th September 1877, accompanied by a Lepcha, who was well acquainted with the country up to the Kánggrá-lámá Lá, and 3 coolies. His instrumental equipment consisted of a pocket compass, a prismatic compass, and a 6-inch sextant. He proceeded to Senchal H. S. distant some 7 miles from Darjeeling, but was detained there for a whole month before he could take the bearings of the trigonometrically fixed peaks and recognize them, as the weather was very cloudy the whole time. On the 27th of October it cleared up for a while and enabled him to see all the peaks: he then returned to Darjeeling. On the 29th October, starting from the bench-mark in the Darjeeling bazár, he carried a route survey down to the right bank of the Rangit river, near Rangit village. The river here is deep, and cannot be forded. The first portion of this route lay through tea-plantations; the remainder through thick forest. Crossing the Rangit by a *jhula* or cane bridge, the explorer proceeded to Patam where he took observations for latitude, and then ascended a hill near by called Phiram to take bearings to peaks; in this however he failed owing to the cloudy weather. From Patam he went to Changthang at the junction of the Lásinh and Láchhung Rivers, where he remained for 3 days but was unable to get any observations owing to the clouds. Fearing to delay on account of the lateness of the season, he pushed on through Lásinh Chauki to Thángú; but the sky being still heavily overcast, he wasted no time here waiting for it to clear, but proceeded to the Sarolá Lakes. Near the lakes his progress was temporarily arrested by some Tibetan officials who ordered him either to return or to shew a *parwána* (order or permit) from the Sikkim Rájá; on giving them a bribe however he was allowed to proceed. At the Sarolá encamping ground he was again met by the same demand from other Tibetan officials, who were also bribed in their turn, and he proceeded to the Giamchana Lake, a few miles further. Here he was for the third time questioned, and peremptorily ordered back, so he returned for a short distance, and, halting for the night at a station of his former route survey (No. 167) took observations for latitude there, as he saw no hopes of being permitted to proceed quite up to the Kánggrá-lámá Lá. He then returned to Thángú; and, taking his observations for latitude there, attempted to ascend the Phalung hill about 5 miles east of Thángú, but was obliged to give it up on account of a heavy fall of snow.

From Thángú the explorer returned to Changthang where he had to remain 8 days before the sky was clear enough to enable him to observe the latitude; he then ascended a hill close by for bearings, but did not succeed in obtaining any as the clouds had again come up and hidden the hill tops. From station No. 108 of his former route he then traversed up the Láchhung River a short distance and thence to the Thánká Lá, a pass about  $8\frac{1}{2}$  miles east of the village of Láchhung. The road up the Láchhung River, as far as the village, was good; it crossed the river in three places by wooden bridges, 39, 35 and 15 paces in length respectively. From the Thánká Lá he obtained the bearings of Chumalári, Kanchinjanga and two other well known peaks.

From Thánká Lá the explorer marched to Sindam Lá, about 2 miles north of Patam, where he took observations for latitude. He then carried a route survey up to a hill about 12 miles to the west and succeeded in obtaining the bearings of several trigonometrically fixed peaks. This hill is called the Karangit Kurson Lá or Karkang Lá; and near it, according to local rumour, is a large lake (surrounded by red stones) which, on the approach of any one, overflows its banks and drowns the inquisitive intruder. The explorer endeavored to visit this wonderful lake himself, but there being no path, and the forest being dense and impenetrable he gave up the attempt.

Returning from Patam to the Rangit, the explorer proceeded to Kálingpung and from there took a traverse *viâ* Rangit to his original starting point—the bench-mark in the Darjeeling bazár.

With regard to game, the explorer only notes that in the Láchhung forest there were Muskdeer, and Ghural (another kind of deer), also Munál pheasants. On the banks of the Giamchana Lake he saw a number of birds which he describes as of a drab color, as large as a goose, with a short neck and a small tuft on the head; these were probably snow pheasants.

A tabular statement of the explorer's latitude observations is appended.

*Compiled under the supervision of J. B. N. Hennessey, Esq., M. A., F. R. S., Deputy Superintendent 1st Grade, Survey of India, In charge Head Quarters' Offices, Dehra Dún.*

*Observations for Latitude taken by Explorer I—on his Route from Darjeeling to Kángvá-lámá Lá, in 1877.*

OBJECT OBSERVED	STATIONS OF OBSERVATION									
	Patam		Changtháng		Thángú		Giamchana		Sindam Lá	
	Date	Double Altitude	Date	Double Altitude	Date	Double Altitude	Date	Double Altitude	Date	Double Altitude
Sun	Nov. 8th	92° 37' 20"	Nov. 16th	87° 51' 0"	Nov. 27th	82° 30' 0"	Nov. 24th	83° 18' 30"	Dec. 22nd	78° 56' 40"
"	"		17th	87 21 40	"		"		" 29th	79 23 0
"	"		18th	86 52 40						
"	"		Dec. 3rd	81 10 0						
"	"		" 6th	80 22 30						
"	"		" 7th	80 8 30						
Polaris					Nov. 27th	58° 33' 20"	Nov. 24th	58° 51' 0"	Dec. 19th	57° 33' 20"
"					"				" 22nd	57 33 10
"					"				" 29th	57 33 20
Sirius	Nov. 8th	92° 15' 20"	Dec. 6th	91° 49' 10"	Nov. 27th	91° 12' 20"	Nov. 24th	90° 56' 30"	Dec. 29th	92° 13' 20"
"	"		" 7th	91 49 0	"		"		"	
Rigel	Nov. 8th	103° 39' 0"	Dec. 7th	103° 13' 10"	Nov. 27th	107° 39' 0"	Nov. 24th	107° 20' 0"	Dec. 29th	108° 37' 30"
"	"		"		"		"		"	
α Hydræ			Dec. 6th	108° 39' 0"	Nov. 27th	108° 2' 30"				
"			" 7th	108 39 30						
Fomalhaut	Nov. 8th	64° 50' 0"	Dec. 3rd	64° 22' 20"			Nov. 24th	63° 28' 40"		
"	"		6th	64 22 30						
"	"		" 7th	64 22 20						
β Ceti	Nov. 8th	88° 2' 30"	Dec. 3rd	87° 36' 0"			Nov. 24th	86° 42' 20"	Dec. 19th	88° 0' 30"
"	"		6th	87 35 30					" 22nd	88 0 30
"	"		" 7th	87 34 30					" 29th	88 0 40

NOTE.—Each of these double altitudes must be diminished by 4' 30" (index error of the sextant) before finding the corresponding latitude.

*Resulting Latitudes.*

OBJECT OBSERVED	Patam	Changháng	Thángú	Giamchana	Sindam Lá
Sun	27° 22' 58"	27° 36' 28" 36 21 36 26 36 5 36 31 36 37	27° 54' 9"	28° 4' 24"	27° 24' 6" 25 54 Mean 27° 25' 0"
Polaris			27° 52' 31"	28° 1' 21"	27° 22' 34" 22 30 22 36 Mean 27° 22' 33"
Sirius	27° 22' 48"	27° 36' 17" 35 51 Mean 27° 36' 4"	27° 54' 15"	28° 2' 11"	27° 23' 36"
F. 5el	27° 23' 2"	27° 35' 59" Mean 27° 35' 36"	27° 53' 0"	28° 2' 30"	27° 23' 38"
Hydre		27° 35' 28" 35 44 Mean 27° 35' 36"	27° 54' 0"		
Fomalhaut	27° 22' 34"	27° 36' 22" 36 17 36 21 Mean 27° 36' 20"		28° 3' 14"	
β Ceti	27° 22' 30"	27° 35' 52" 36 6 36 36 Mean 27° 36' 11"		28° 2' 44"	27° 23' 84" 23 34 23 28 Mean 27° 23' 32"
Mean Latitudes	27° 22' 48"	27° 36' 5"	27° 53' 35"	28° 2' 44"	27° 23' 40"
Lat. on Hooker's Map to nearest minute	27 24	27 38	27 53	27 56	



