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## EXPLORATION AND SURVEY WITH THE TIBET FRONTIER COMMISSION, AND FROM GYANGTSE TO SIMLA VIÂ GARTOK.\*

By Major C. H. D. RYDER, D.S.O., R.E.

### I. THE MAIN EXPEDITION.

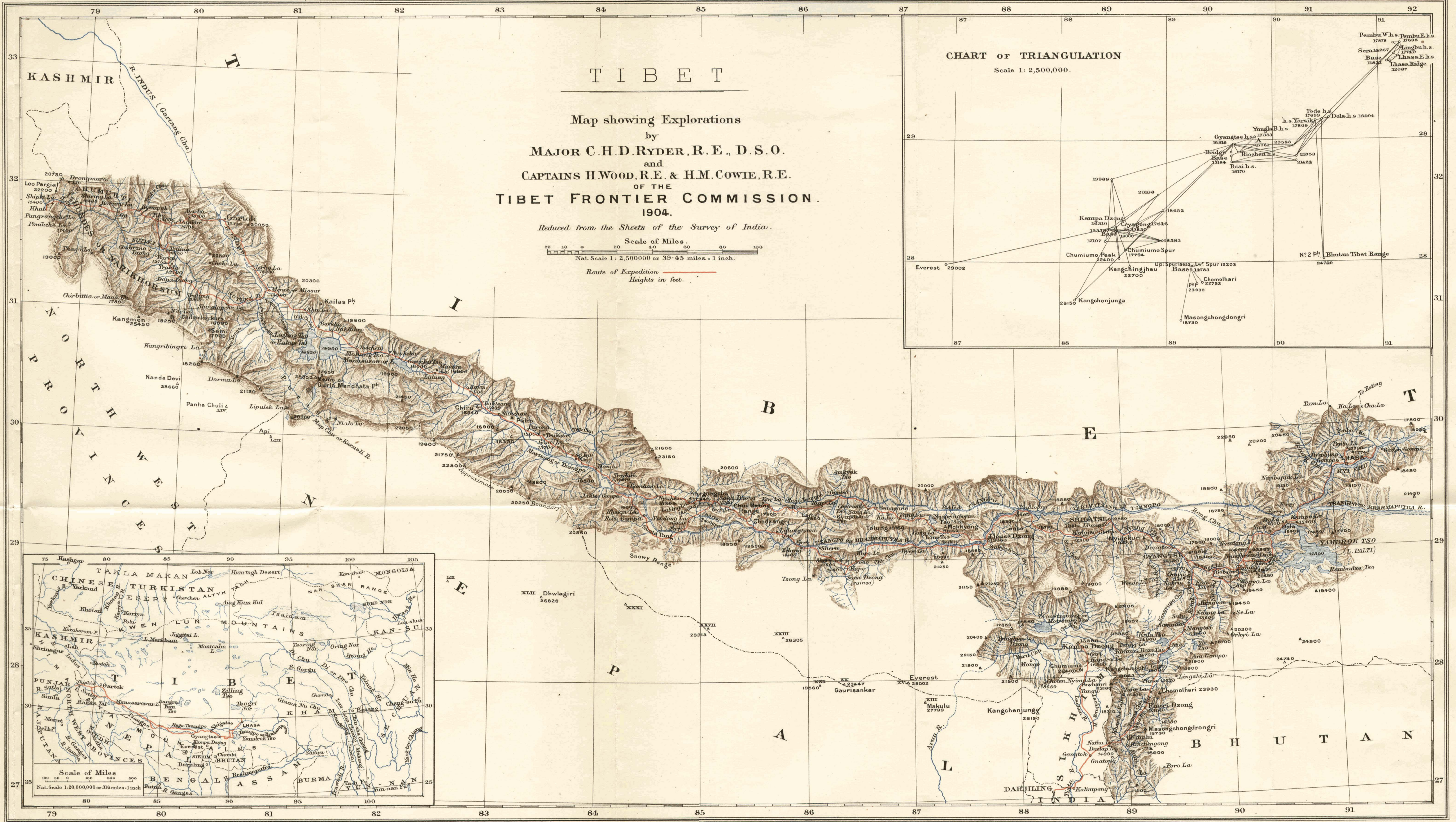
IT has been said that the geographical results of the expedition to Lhasa have been disappointing. No one was better pleased than myself that this was in a sense true. Our knowledge of the country lying between our frontier and Lhasa depended chiefly on the surveys executed by different explorers trained by and working under the supervision of officers of my department—the Survey of India. They worked under extraordinary difficulties, and in great danger of their lives. That, when at last we have been able to carry through a regular and systematic survey of the country, we have not been able to find that the rough maps prepared from these explorers' surveys were in any important points other than very fairly accurate, reflects the very highest credit on these men, notably the late Pandit Nain Singh and the explorer A.-K., the latter of whom is still alive. In place of these rough maps, we have now an accurate survey of the country traversed by the expedition.

On September 24, 1903, I received orders at Bangalore to join the Tibet Frontier Commission at Kampa Dzong. Proceeding *via* Calcutta, where I had to spend a few days collecting instruments and kit, I arrived at Silliguri, the railway base, on October 3, and marched out the same afternoon to Sevoke, where the Teesta leaves the hills. This was not the time of year to see the Teesta valley at its best; very hot,

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\* Read at the Royal Geographical Society, May 15, 1905. Maps, p. 480.  
No. IV.—OCTOBER, 1905.]

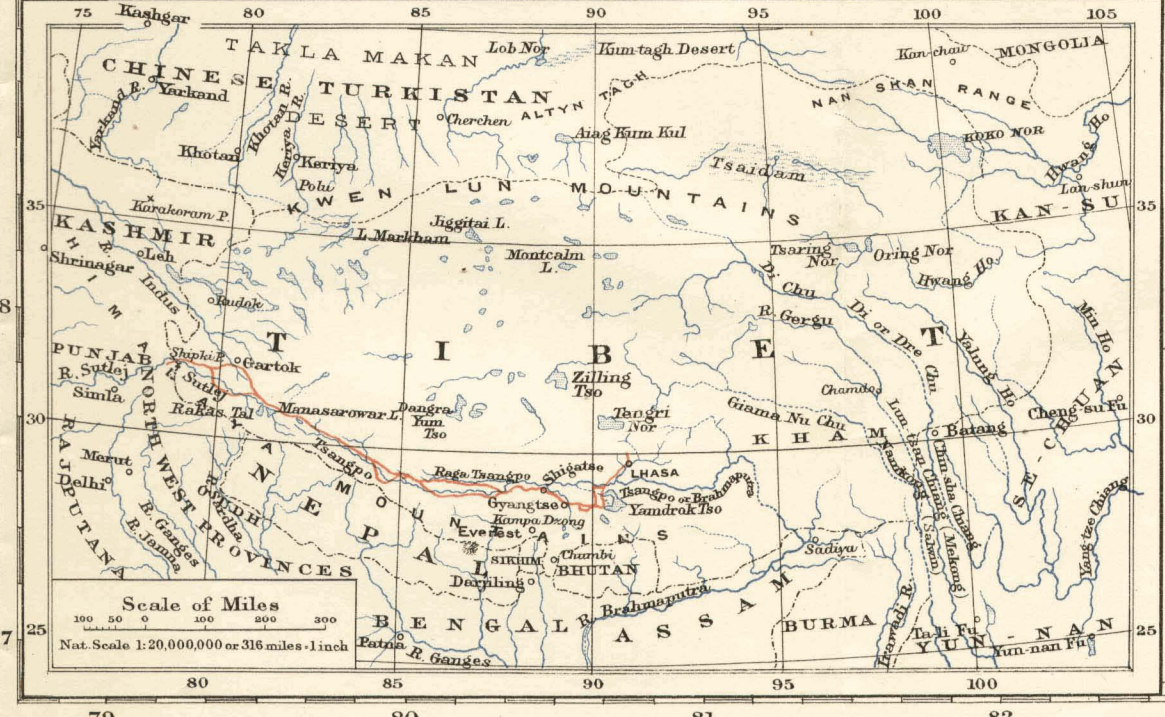
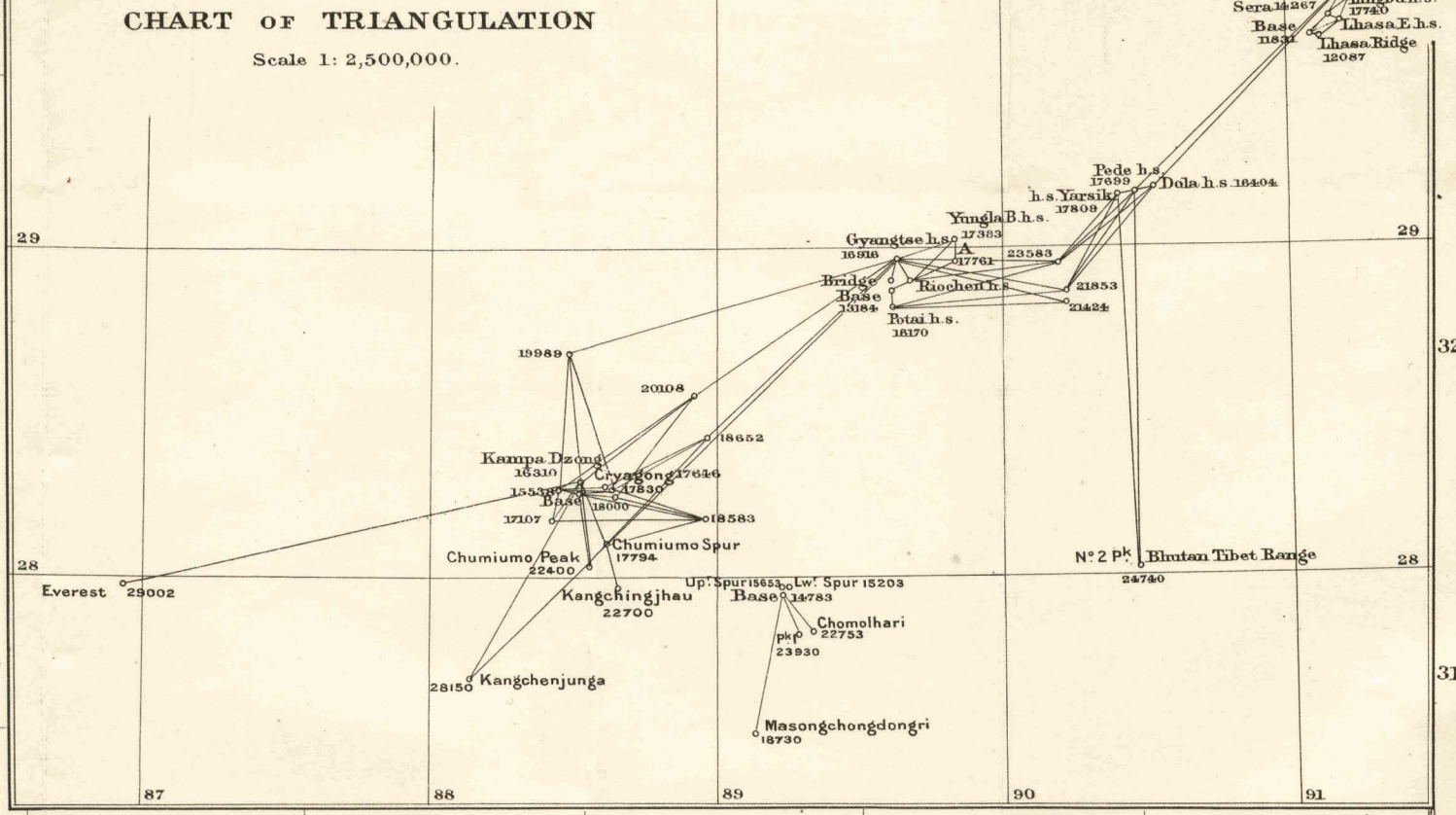




# TIBET

Map showing Explorations  
by  
MAJOR C.H.D. RYDER, R.E., D.S.O.  
and  
CAPTAINS H.WOOD, R.E. & H.M. COWIE, R.E.  
OF THE  
TIBET FRONTIER COMMISSION.  
1904.

Reduced from the Sheets of the Survey of India.  
Scale of Miles.  
Nat. Scale 1: 2,500,000 or 39.45 miles - 1 inch.  
Route of Expedition  
Heights in feet.





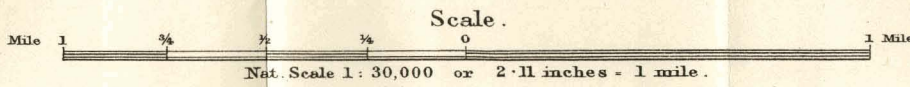
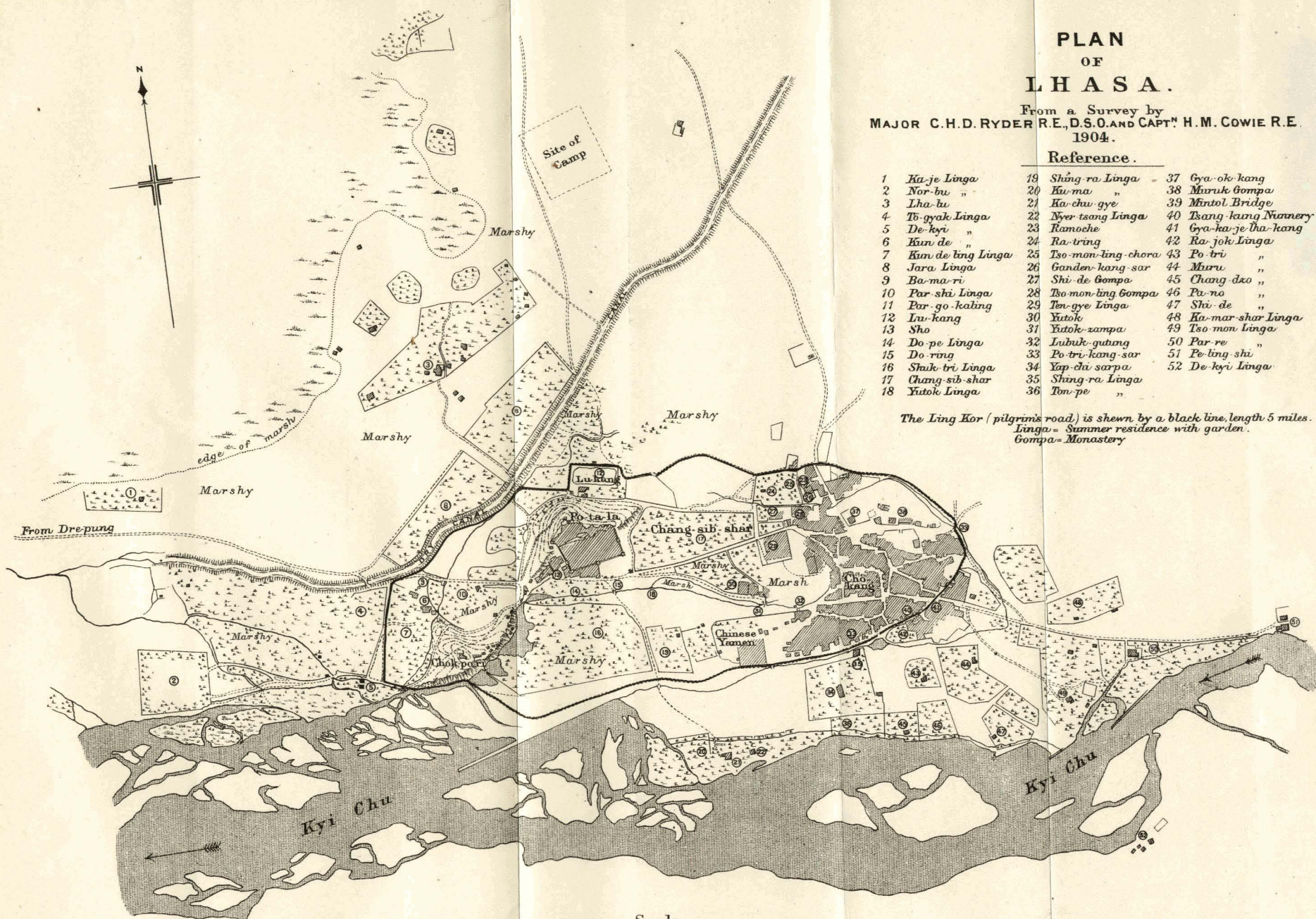
# PLAN OF LHASA.

From a Survey by  
MAJOR C. H. D. RYDER R.E., D.S.O. AND CAPT. H. M. COWIE R.E.  
1904.

## Reference.

1	Ka-je Linga	19	Shing-ra Linga	37	Gya-ok-kang
2	Nor-bu "	20	Ku-ma "	38	Muruk Gompa
3	Lha-tu "	21	Ka-chu-gye	39	Mintol Bridge
4	Ts-gyak Linga	22	Nyer-tsang Linga	40	Tsang-kang Nunnery
5	De-kyi "	23	Ramoche	41	Gya-ka-je-lha-kang
6	Kun-de "	24	Ra-ving	42	Ra-jok Linga
7	Kun-de-ting Linga	25	Tso-mon-ting-chora	43	Po-tri "
8	Jara Linga	26	Ganden-kang-sar	44	Muru "
9	Ba-ma-ri	27	Shi-de Gompa	45	Chang-dao "
10	Par-shi Linga	28	Tso-mon-ting Gompa	46	Pa-no "
11	Par-go-kaling	29	Ten-gye Linga	47	Shi-de "
12	Lw-kang	30	Yatok	48	Ku-mar-shar Linga
13	Sho	31	Yatok-zampa	49	Tso-mon Linga
14	Do-pe Linga	32	Lubuk-guting	50	Par-re "
15	Do-ring	33	Po-tri-kang-sar	51	Pe-ling-shi "
16	Shak-tri Linga	34	Yap-chu sarpa	52	De-kyi Linga
17	Chang-sib-shar	35	Shing-ra Linga		
18	Yatok Linga	36	Ton-pe "		

The Ling Kor (pilgrims road) is shown by a black line, length 5 miles.  
Linga = Summer residence with garden.  
Gompa = Monastery





raining nearly every day, the march up the valley was far from pleasant. The cart road, now open as far as Gangtok, was then constantly blocked by landslips, and very slippery. After Gangtok was passed the views of the snows should have been magnificent, but the higher hills were veiled in clouds. All the more pleasant, therefore, was the marked change once the frontier pass, the Kangra La, was crossed; clouds were left behind, and during the two months I stayed at Kampa Dzong we had nothing but the finest weather, with that wonderful clear atmosphere which every traveller in Tibet has remarked on.

Down the long slope from the Kangra La, and over the rolling downs near the valley of Giri, the great snowy range gradually opened out, till on reaching Kampa Dzong, or at any rate from the hill above it, one continuous line of snows was visible stretching from Chumolarhi to Mount Everest, a distance of some 150 miles. We were able to survey from this snowy range northwards to the Arun river—Tsangpo watershed, the Tibetans, beyond sending men to watch us, making no attempt to stop us surveying so long as we did not camp away from the mission post.

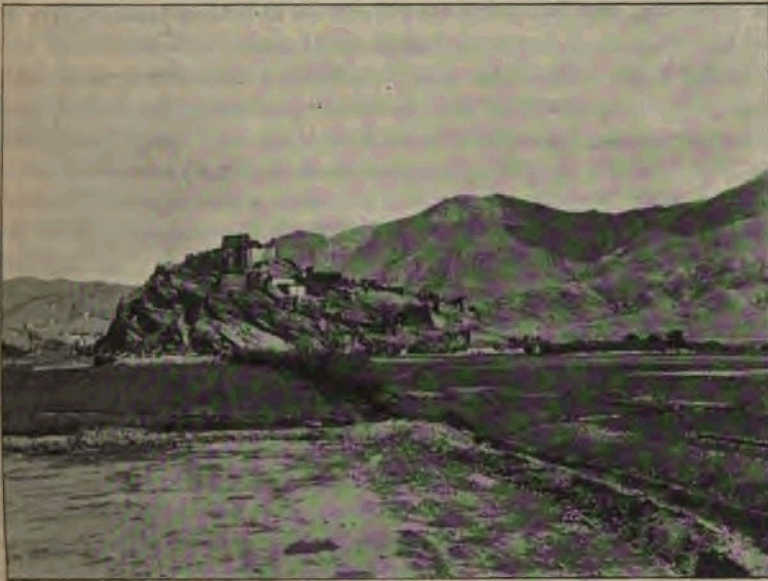
As regards the heights of peaks, our results were of a negative nature. The highest point on the above-named watershed was 20,100 feet; the two "very high snowy mountains" mentioned by Mr. Freshfield on p. 362 of the *Geographical Journal* for March, 1904, quoting from one of the explorers, were disappointing, being only 21,200 feet in height. The fine snowy range apparently running north from Everest, but in reality running north but some 30 miles east of Everest, has its highest summit at an elevation of 22,200 feet. In the photograph by Mr. Hayden (*R.G.S. Journal*, March, 1904), it will be noticed that the northern side (*i.e.* the right-hand one in the photograph) of Everest has a continuous slope, which I estimated at 7000 feet; and it is extremely unlikely that north of Everest, and hidden by the nearer snowy range (on the right edge of the photograph), the peaks could again rise to a height anywhere approaching that of Everest. It is interesting here to note that Everest, as viewed from Kampa Dzong, does not appear as the highest peak of a group, but as one massive summit standing by itself. Nowhere could we hear of any local name for Everest, although careful inquiries were made. The height of Kampa Dzong itself proved to be 15,200 feet instead of 13,800, as on previous maps.

Fortunately, just as we had completed all the surveying possible from Kampa Dzong under existing circumstances, it was decided that the mission should retire from Kampa Dzong and advance over the Dzelap La and up the Chumbi valley. We accordingly hurried across Sikhim and caught up the main body of the mission and its escort at Chumbi. This valley is disappointing; it has always had a great reputation, but we found it to be only 200 or 300 yards wide, and not very rich. The houses at Rin-chen-gong are good, but that is not due

to any richness in the valley itself, but to the fact that the Tomos, the inhabitants of the valley, have a monopoly of the carrying trade from Phari Dzong down into Sikkim.

A short halt here enabled me to get the lower end of the valley surveyed, and to detach Sub-Surveyor Dalbir Rai, who followed the valley down to the plains, and, returning to Gnatong by the adjoining valley, completed a most useful piece of work, including a hitherto unsurveyed portion of Bhutan.

The mission then moved up to Phari Dzong and over the Tang La (height 15,200 feet), a very easy pass to Tuna (height 14,800 feet).



GYANGTSE.

Here we spent the winter, and, except for some work in the Chumbi valley, surveying was nearly at a standstill; the Bhutan snowy range on the east, lower rounded hills on the west, and the Tibetan force at Guru, 6 miles north of us, limited our sphere of observation. The cold was intense, and a very unpleasant three months were spent before we again advanced. Towards the end of March Mr. Hayden, of the Geological Survey, and I, with an escort of twenty rifles, made a short excursion across the plain to explore the Lingshi La, a pass crossing the snowy range into Bhutan. Before, however, reaching this point, we were met by a small Tibetan force and requested to return. In view of my knowledge that Colonel Younghusband was very anxious to avoid, if possible, a collision with the Tibetans, I decided to retire to Tuna.

General Macdonald and the main force having arrived at Tuna, it was decided to make a preliminary advance to Guru, where the Tibetans were encamped, and establish a post there. Unfortunately for them, the Tibetans decided to oppose our advance. A short fight took place, in which the Tibetans suffered heavily. On April 2 Captain Cowie joined us, just in time for the advance to Gyangtse, which took place on April 4.

We camped on April 4 at Guru; we then marched round the shore of the Bam Tso to Chalu, and the following day did a short march down the narrow valley along which the stream flows connecting the Bam Tso with the Kala Tso. I ascended a point on the range between the two lakes, and had a fine view down on to both of them. The Bam Tso has an area of about 25 square miles, and the Kala Tso of about 15 square miles. Next day, April 7, we had a level march to Mangtsa, where the open country ends. There is no outlet to the Kala Tso, but there are obvious signs that in ancient times the water flowed out of the lake into the narrow gorge, and so to Gyangtse and the Tsangpo. About 8 miles from the lake in this direction a small stream rises from what is probably an underground flow from the lake, and flows in a broad and deep bed down the gorge.

From Mangtsa the force marched to 3 miles short of Kangma, down a narrow gorge, while Captain Cowie and I ascended the range to the east to a height of about 18,000 feet, to try and get a view ahead. In this we were not successful, still higher hills on the north on both sides of the gorge blocking our view. The Tibetans were reported by the mounted infantry to be in force holding a wall across the valley at Kangma; but next day their position, a strongly built wall, which, however, could have been easily turned, was found evacuated. Next day they were located in a position holding a narrow gorge known as the Red Idol gorge, and the precipitous hills on either side. Out of this they were easily turned by a direct attack and a long flanking climb on the part of the Gurkhas. We camped at Sapu that evening, and marched on to the Gyangtse plain the following day. On April 11 the dzong, or fort, of Gyangtse was surrendered by the Tibetans, who seemed cowed by the defeats they had received. The mission was established in a village on the right bank of the Nyang Chu, where there is a bridge, and about 1000 yards from the dzong.

A force under Colonel Brander was left as escort, while the General and the main force returned to the Chumbi valley, leaving posts at Kangma, Kala Tso, and other places on the line.

We now settled down to a peaceful existence. A bazaar was established outside the post, and officers in small parties could wander about the plain shooting.

Captain Cowie and I were then able to start triangulation off a measured base, and, with the help of three stations on the hills, were

able to complete all the work that was possible; but we were not then able to connect this triangulation with my Kampa Dzong and G.T. peaks, but we fixed some peaks on the Karo La range, which afterwards proved invaluable in connecting the Lhasa triangulation with this work.

Towards the end of the month a report came in that a force of Tibetans had collected on the Karo La, 45 miles from Gyangtse, on the road to Lhasa. A party, consisting of fifty men of the 32nd Pioneers and thirty mounted infantry, under Lieut. Hodgson, was sent out to verify this report. As this would afford an opportunity of getting in a good addition to our map, I decided to accompany the party with Captain Cowie.

We reached Ralung, two long marches from Gyangtse, on April 29, and the following day, accompanied by the mounted infantry, rode up to the pass, about 2 miles beyond which we saw the wall which the Tibetans had built. Lieut. Hodgson took a few men forward to draw their fire and make them disclose their strength. In this he was successful, and withdrawing his men without loss, although some Tibetans concealed on the hills above were rolling rocks down on him, we rode back to Ralung. I had intended taking the mounted infantry to Kangma in one long day's march, as it was important to have this route reconnoitred, but, owing to the presence of the Tibetans in such force on the Karo La, this was not now considered advisable, and we returned to Gyangtse in two marches, arriving there on May 2.

Colonel Brander decided to take out a force to turn the Tibetans out of their position on the Karo La, as they were threatening our line of communications. On May 3 he accordingly started, Captain Cowie again accompanying, as I hoped he might be able to get the route from Ralung to Kangma done this time. They attacked the Tibetans on the 6th, and drove them out of their position, but, owing to our having in the mean time been attacked at Gyangtse, Captain Cowie had to return with the force.

On the 4th everything at Gyangtse seemed peaceable. I had been out for a long day surveying on the hills to the south, and on my return heard of a report, originating from one of the patients in Captain Walton's civil hospital, that we were to be attacked next day. A small mounted infantry patrol went some miles down the Dongtse road, but found nobody. The Tibetan force, however, was at Dongtse itself, and, leaving when the moon rose about 1 a.m., attacked us just after dawn. Their attack was a complete surprise, but once our men turned out, the Tibetans were easily driven off with heavy loss. If, however, the Tibetans had not given the alarm by shouting and firing their guns, but rushed in with their swords, we should have been in a rather awkward position. Another force of theirs had in the mean time occupied the dzong, from whence they opened a heavy fire, which, to every one's surprise, more than reached our post. The fighting in and around



Gyangtse has been already often described; it culminated in the capture of the dzong on July 6.

Captain Cowie and Surveyor Sher Jang, who had come up with the relief force, now rejoined me, and on July 14 we commenced our march to Lhasa. Owing to the cloudy weather rendering triangulation impossible, I thought it advisable, in case we could not afterwards connect Lhasa and Gyangtse by triangulation, to run a subtense bar traverse; this entailed Captain Cowie and I being on the road all day, starting with the advance guard and getting in in the evening. The weather, too, was very bad, heavy rain falling almost every day, effectually dispelling the prevailing notion that this part of Tibet is a rainless country.

The Karo La (height 16,200 feet) was crossed on July 18, the bulk of the Tibetans holding the position bolting the night before from the wall in the valley, leaving their companions on the hills to their left to escape as best they could. They were easily driven out of their position by the 8th Gurkhas, who, however, established a record in hill fighting at high altitudes, the Tibetan position reaching an elevation of 18,500 feet, and their retreat leading across the face of a glacier.

The next day the force moved to Nangkartse Dzong, in sight of the Yamdrok Tso. The snow-peak marked in former maps in the centre of the promontory, round which the Yamdrok Tso makes an almost complete circle, is a myth. No hill there has permanent snow, though, as their height is about 17,000 feet, there doubtless is often snow lying there when there is none at Nangkartse Dzong, or on the shore of the lake (height 14,350 feet). After a day's halt we marched to Yarsik, where the original outlet of the lake obviously existed. We then marched for two more days along the shores of the lake, which all along this part is never more than 2 or 3 miles wide, and very often less.

We crossed the Kampa La (height 15,400 feet) on the 24th, an easy ascent from the lake-side, but a very long drop down to the Tsangpo. Owing to the low elevation (11,550 feet) and Sarat Chandra Das's description, I thought that the valley would have been well wooded; this, however, was not so: the hills were quite bare, and no trees grew wild, though round every village there were fine groves. We moved on 6 miles down the river to the place selected for the crossing, where the Tibetans had kindly left a large ferry boat on our side of the river.

The whole force had crossed on the 30th, a very laborious process. The valley here is broad and well cultivated, the river running in most places in several broad channels, with sandy islands in between. It was about at its highest flood-level soon after we had all crossed, with a very fast current and deep, and 140 yards wide.



On July 31 we moved off, and after a few miles turned up the Kyi Chu, a well-cultivated valley with a broad shallow river resembling the Tsang-po valley on a slightly smaller scale.

On August 2 we arrived at the Tolung Chu, a large affluent of the Kyi Chu, and over which there is quite a good bridge. From here we were rewarded by our first sight of the Potala, the residence of the Dalai Lama, situated on a small isolated hill overlooking Lhasa.

Next day camp was moved to within a mile of the Potala; this was, however, only a temporary camp, and, being swampy, another site was selected on drier ground north of the town, the mission being located in a very good house in pretty wooded grounds outside the town. The weather was not favourable for surveying—rain fell constantly, and



BRIDGE OVER THE NYANG CHU ADJOINING OUR POST, WITH GYANGTSE DZONG  
IN BACKGROUND.

heavy clouds lay on the surrounding hills—so Captain Cowie and I confined ourselves, after measuring a base, and observing a latitude and azimuth, to the survey of the town and suburbs of Lhasa on the scale of 6 inches to the mile. This took some time, as we were at first not allowed to enter the town itself; but later on, having got in all the somewhat extensive groves, gardens, and summer residences outside the town, we were allowed to march through the streets with an escort. In order to avoid attracting attention, for this portion of the work we did not use a plane-table, but made a compass and pace traverse from one fixed point outside through to another fixed point on the other side. The inhabitants showed some curiosity, but no hostility, at our proceedings. The height of the plain above sea-level is 11,830 feet. Captain Cowie left Lhasa on August 29 to return to Gyantse, to try and secure the connection in the triangulation between that town and the points I had fixed from Kampa Dzong. The



weather now began to improve, and I was able to go out with a small escort, firstly, up the valley a day's march, from whence I took mounted infantry up to the junction of the Penbo Chu with the main valley, just opposite the Garden Monastery and some 30 miles from Lhasa; and, secondly, up the Tolung Chu, a somewhat similar expedition.

Having done these two trips, there only remained to go up on to the Penbo La, the pass on the main road leading north from and about 10 miles from Lhasa. This was important for the triangulation, and I was lucky to do all that was necessary in a short spell of fine weather, which just coincided with the five days I spent in camp at the foot of the pass, climbing an 18,000-foot hill each day.

From this range we were able to sketch in carefully the adjoining valley to the north, a broad, well-cultivated, and thickly populated plain; and from three stations I was able to connect on with the peaks of the Karo La range, and also to fix many points north and eastwards, including some fine snow-peaks south of the Tengri Nor, mentioned by Mr. Littledale, the highest of which was 23,250 feet in height, and the highest peak we ever came across north of the Tsangpo. Two other snow-peaks which I fixed are, I believe, those mentioned by M. Bonvalot, and christened by him Mount Hue and Mount Gabst; but their heights were disappointing, the highest being 21,500 feet.

The treaty had been formally signed at the Potala on September 7, and on the 23rd we left on our return march. On this occasion we recrossed the Tsangpo 10 miles higher up, and crossed the range between it and the Yamdrok Tso by the Do La, 16,000 feet, a long steep climb from the river. From this pass, the weather being clear, I had a fine view, and was able to fix a station by observations to peaks on the Karo La range and to two Bhutan peaks, already fixed from India, being also able to see and observe to one of my stations on the hills north of Lhasa. I had gone on ahead of the main force, with an escort of one hundred Gurkhas under Major Row. Next day we marched along the lake to Yasik, and I went up on to the range again, and, observing from two more stations, completed a good area of triangulation, and secured the required connection between the triangulation done from Gyang-tse and that done at Lhasa.

At Yasik on September 30 we met Captain Cowie, who, though much hampered by the cloudy weather, had effected a satisfactory connection between the Gyangtse triangulation and the Kampa Dzong work. We here struck off the main route up the side valley, across a very low, in fact almost inappreciable, watershed, and followed down the narrow valley known lower down as the Rong Chu, which flows into Tsangpo. I have no doubt whatever that this is the old outlet of the Yamdrok Tso, which now is land-locked. Next day we left the valley, camping near the Nyadong La, crossed the pass next day (height 16,000



feet), and so on to the plain above Ralung. This survey was useful, in that it showed the possibility of turning the Karo La. Captain Cowie then made a round from Ralung into the Niru valley, down to Gobshi, and so to Gyangtse, while I caught the general up on the main road, and accompanied the main force. I now made arrangements for Captain Cowie to complete the work remaining between here and Chumbi, on which he writes as follows :—

“On October 8, with Sub-Surveyor Hazrat Ali and a portion of the survey detachment, I left Gyangtse for Kangma, which was reached next day. Commencing a route-survey from this village on the 10th, we struck off the line of communications, marching eastwards through a narrow defile in the bare rocky hills dividing the waters of the



THE CROSSING OF THE TSANGPO OR BRAHMAPUTRA.

Nyang Chu and the Niru Chu. As far as the Nilung La, which we crossed the same day, we followed the track which is part of the main road from Kangma to Ralung *viâ* the Wogya La. After crossing this pass and descending into the open plain, which receives the headwaters of the Niru Chu, we turned southwards, heading for the Bham Tso. Passing over the low rolling hills which intervened, we reached the lake on October 14, completing the survey of this locality, and fixing the position of the Yu Tso, a lake lying at the foot of the snowfields of the big range, culminating further to the south-west in Chumolhari. On the 14th I got into communication with the headquarters staff, who had just reached Kala Tso, and, for the purpose of adding to the half-inch survey of the Khambu valley, obtained sanction to strike off the line of communication at Tuna, and, crossing a pass some 12 miles west of the Tang La, to follow the course of Khambu Chu, eventually rejoining the line at Chumbi.

“Surveyor Shar Jeng, who had accompanied the force from Gyangtse as far as Kala Tso, joined me at Chalu on the 14th. On the 16th we



left Tuna, taking with us from there a Tibetan who professed to know the hills to the east of Powhanri, and camped in the small valley below the pass.

"On the evening of the 16th snow began to fall, and by the 17th and 18th a severe blizzard had set in. We left camp on the 17th in the midst of it, purposing to cross over into the Khambu valley, but were unable to reach even the pass. In consequence of mist and the thick driving snow, it was impossible to see more than a few yards in any direction; we had no track to guide us, and the snow was nowhere less than 2 feet deep. The difficulties of progressing were great, and in addition we, the guide included, lost our way. Though only a few of the party were frost-bitten, many had begun to suffer from snow-blindness. Finding it impossible to proceed, with much trouble we eventually got back on the 18th to a point near our camping-ground of the 16th. Next day, with over 50 per cent. of the party incapable from snow-blindness, we crossed the Tang La and reached Phari in the evening. On the 22nd I reached Chumbi, and reported to the G.O.C. (the telegraph line having been broken by the storm), who had sent out a search party for us from Chumbi.

"All of the party had recovered from snow-blindness and the effects of exposure sufficiently to move to Chumbi on the 26th. The whole of the survey detachment left Chumbi on the 28th, and, marching *via* the Nathu La and Gangtok, reached Siliguri on November 5."

The survey results of the expedition are as follows:—

*Triangulation.*—An area of 45,000 square miles was completed, connecting Lhasa with India, and fixing all prominent peaks which were visible, with their heights.

*Topography.*—An area of 17,000 miles was surveyed on the scale of 4 miles to the inch, of which 3000 square miles, in the neighbourhood of the Chumbi valley, Gyangtse, and Lhasa, were also surveyed on the scale of 2 miles to the inch.

Route surveys, on the scale of 1 inch to the mile, were made of the road to Lhasa.

Large-scale plans were also made of the towns of Gyangtse and Lhasa.

## II. FROM GYANGTSE TO SIMLA *VIA* GARTOK.

When the treaty was signed at Lhasa on September 7, 1904, it was decided that a party should proceed to Gartok to examine the place, as it was one of the trade marts which the Lhasa Government had decided should be opened in Tibet. It was obvious that this would afford a great opportunity of adding to our geographical knowledge of the country. The ostensible object of the journey being a political outcome of the treaty, Captain Rawling, of the Somersetshire Light Infantry, who in 1903 had made a remarkable and useful journey in Western Tibet, and





ERODED HILLS OF THE SUTLEJ VALLEY.



CHUMIUOMO, OVERLOOKING PASS TO  
KAMPA DZONG.

*Photograph by H. H. Hayden.*



CHUMOLARHI (to the right) AND SNOWY RANGE AS VIEWED FROM TUNA.

*Photograph by H. H. Hayden.*



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who was now deputed to open the trade mart at Gartok, was placed in general control of the expedition. He was assisted by Lieut. Bailey, 32nd Pioneers, one of the few officers who have acquired a knowledge of the Tibetan language, which proved very useful to us; the survey party consisting, besides myself, of Captain H. Wood, R.E., and Sub-Surveyor Ram Singh, R.S.

In making our arrangements for the journey, two considerations were paramount—firstly, that we should be having a race against winter, with a possibility that, should we be unable to get over the passes into India before the winter snow fell, the unpleasant prospect would have to be faced of having to winter at Gartok or some equally cold and inhospitable spot; secondly, it was quite impossible to tell whether and to what extent the Tibetans would assist us. Fighting had only lately ceased, the treaty had been signed barely a month previously, and there had been no opportunity of seeing whether the Tibetans would adhere to the treaty when our troops were withdrawn to India.

Our time for preparation was very short, every day's delay increasing the probability of our being snowed up. Captain Wood and Lieut. Bailey arrived at Gyangtse, which was to be our starting-point, on September 30, while Captain Rawling and I only reached the same place on October 6 and 5 respectively.

Our transport we organized as follows: twenty-six baggage ponies to give us a nucleus of our own, should the Tibetans make difficulties about providing us with animals; seventeen riding ponies, it being important that, in view of long and continuous marching at a high elevation, as many men as possible should be mounted; one hundred yaks were lent to us from one of the transport yak corps to take us to Shigatse, but not to go beyond that town. From there onwards, however, the Tibetans invariably, and without any demur, provided us with whatever transport we required. Ponies, donkeys, mules, yaks, and coolies at various times carried our baggage, and, although it was difficult to supervise so large and mixed a caravan, no single article was lost during the whole time the journey lasted.

We took two months' supplies for all our men, with two months' extra of such things as ghi, goor, etc., which could not be obtained *en route*; while for the officers' mess we took four months' stores. Meat we could rely on obtaining in abundance, and tsamba or parched barley flour, as long as we came across villages.

Our party was finally organized and ready to start on October 9 as follows:—

Captain C. G. Rawling, Somersetshire Light Infantry; Captain C. H. D. Ryder, R.E., Survey of India; Captain H. Wood, R.E., Survey of India; Lieut. F. M. Bailey, 32nd Pioneers; Sub-Surveyor Ram Singh, R.S.; hospital assistant Hira Singh; three military surveyors; five



sepoys of the 8th Gurkha Rifles; five survey Khalassies; seven pony-drivers; two Hindustani servants; two Tibetan servants; Mahomed Isa, a Ladakhi, who acted as caravan leader; and last, but not least, a very small Lhasa Blenheim spaniel, who followed our fortunes throughout.

In order to have the advantage of the company of Captain O'Connor, who was remaining as trade agent at Gyangtse, and who, with two other officers, was making a trip to Shigatse, we postponed our departure till the 10th.

Our first day's march took us to Dongtse, the late headquarters and supply depôt of the Tibetan army which had attacked the mission and its escort for two long months at Gyangtse; but here, like everywhere else, we were cordially received—mainly, I fancy, owing to our being accompanied by a Lhasa official, who had been deputed to escort us to Gartok, and also to our being supplied with a very strongly worded permit signed with the seals of the Lhasa Government and of the three great Lhasa monasteries, and directing all officials along the route to render every assistance.

Three more marches, following the valley of the Nyang Chu, which is one of the richest and most prosperous valleys of Tibet, landed us at Shigatse on October 14. Here we spent several busy days with an army of tailors, making warm clothing for ourselves and our men, lining all coats with lambskins, making fur caps and gloves, etc., till finally, when fitted out, we presented an appearance akin to Arctic explorers. Our stay at Shigatse was not, however, all work. We paid a most interesting visit to the great Tashi Lhunpo monastery, where the monks received us most cordially, showing us all over the place, and finally giving us refreshments of tea, cakes, and dried fruits. This monastery is said to contain four thousand monks, and although not so large as, is richer than, the great Lhasa monasteries. The bulk of the buildings, the residences of the monks, were of the usual type—narrow paved roads with high houses on each side, dirty, and not picturesque; but we also enjoyed the sight of the tombs of the five previous Tashi lamas, each a separate building with its golden roof and highly ornamented interior, filled with a wealth of turquoise, gold bowls, and rare old jade and cloisonné, the effect being somewhat marred by a foreground of small vessels holding lighted tapers fed by very evil-smelling butter. Bogle's description of his visit is very picturesque and accurate; the number of tombs has now, however, increased from three as seen by him to five as seen by us.

We were fortunate, also, in being received by the Tashi Lama, who, after holding an almost co-equal position to the Dalai Lama, has now, by the deposition of the latter, become the most important ecclesiastic in Tibet. He was living in his summer residence, a house outside the town, to which, with Captain O'Connor as political officer at our head, we proceeded. A little hitch occurred at the gateway, as an arch-

scoundrel, Colonel Ma, who had been the Chinese official at Gyangtse when we were attacked, and had never given us warning, nor even tried to protect the servants and property of his colleague Captain Parr, was also paying a visit. Captain O'Connor refused to enter the house while this individual was in it, and the latter had to be smuggled out by some back door. We were then shown up some steps and along dark passages till we arrived at the reception-room, at the far end of which we could see the Tashi Lama seated cross-legged on cushions on a raised platform. He received us each with a bow and a smile, which we returned, and were shown to seats on one side of the room, while the other side was filled with Tibetan officials and monks in either the ordinary maroon-coloured clothes usually worn



A MAIN STREET IN LHASA.

by monks, or in the yellow silk of the higher temporal officers. Tea, undrinkable as usual, was handed round, but on this occasion it had a certain glamour attached, due to its being served in enormous teapots of gold and silver. Dishes laden with sweetmeats and dried fruits were also brought in, but soon hurriedly removed and handed over to our followers.

While Captain O'Connor was exchanging civilities with the Tashi Lama, we had time to think of the sudden change from a few months before, when the Tibetans, amongst whom was a strong contingent from this very place Shigatse, were attacking us at Gyangtse, to the present moment, when we, a few unarmed officers, were sitting in amity with our quondam enemies. The Tashi Lama himself is an interesting personality; sixth holder of the office, his face is one that would not pass unnoticed anywhere, still less in Tibet. He has clear-cut features,



high cheek-bones, and a pale complexion; his quiet, dignified manner made a lasting impression on us. His age is only about twenty-three, and he seemed generally beloved and revered. During the whole of our visit a slight and pleasant smile never left his face. After silk scarves had been presented to us and our Tibetan followers had been blessed, we left, with the feeling, due partly to the personality of the Lama himself, partly to the room with its dim light, that we had been assisting at some religious ceremony.

We had commenced our survey at Dongtse, one march from Gyangtse, and as we wished to keep up triangulation, Captain Wood and I left Shigatse on October 17 to do two short marches, the rest of the party leaving a day later and doing the two marches in one. Owing to bad weather, which gave us some rain and covered the surrounding hills with snow, we were unable to reach our hill, so decided to halt a day at Kangjen Gompa, a most delightful camp in a grove of trees. This was the same storm which entailed such hardships on our force returning to India in the neighbourhood of Phari Dzong. Fortunately for us, we were here at the lowest point of our journey, the height of Shigatse being 12,570 feet, and escaped with only slight inconvenience.

By visiting these hills, one of which was over 18,500 feet in height, and from two of which we had fine views of Mount Everest, Captain Wood was enabled to carry on the triangulation under very adverse circumstances. To climb one of these hills is itself a hard piece of work; to observe at the top in a bitter wind is one of the most physically painful operations I have ever experienced. To do this in combination with a day's march leads to a very long and hard day's work. Captain Wood carried this on for days and months with hardly any intermission—a feat which could only have been accomplished by an officer of his energy and determination.

Until we reached Pindzoling, on October 22, the river had been a few miles to the north of our route, but from thence we followed the river more closely. Two more marches and we were at Lhatse Dzong; a dzong or fort on a small rocky hill, very similar to those at Shigatse and Gyangtse, surrounded on one side by the river and on the others by a fair-sized monastery and a small town. The valley here widens out into a plain, cultivated in parts, barren elsewhere. At Lhatse Dzong we halted a day, which enabled Captain Wood and I to ascend a hill a few miles east of the town, overlooking a broad bare valley which leads to the very famous Sakya monastery. We regretted that want of time, and the consideration that it was not advisable to divide into two parties until we had thoroughly tested the friendly disposition of the Tibetans, had prevented us from paying a visit to this monastery.

From Lhatse, however, the Tibetans having shown no desire but to assist us in every way, we decided to separate. While Captain Wood and Lieut. Bailey followed the main route, which here crosses and

leaves the river, Captain Rawling and I stuck to a route reported to follow up the south bank, as I did not wish, if possible, to omit any portion of the river from our survey.

Accordingly, on the 26th we parted company, camping that night on opposite sides of the valley, which now closed in. We kept to the river the following day, but on the 28th we had to leave it, and for two marches followed up a side stream, the Chi Chu, running parallel to and only 2 or 3 miles distant from the Tsangpo, which we again rejoined on the 30th. On November 1 we could see that the river ran between rocky hills with snow-peaks on either side, and had to leave it, making a wide *détour* to the south. We marched up



BIRD'S-EYE VIEW (LOOKING DOWN VALLEY) OF CHI CHU VALLEY FROM HILL ABOVE DABONG. DABONG IN RIGHT-HAND CORNER.

a side nullah, camping in bitter cold at nearly 16,000 feet, and crossing the Kura La, a very desolate pass, next day, at an elevation of 17,900 feet; marching across the head of a plain which forms the headwaters of the Chi Chu, previously mentioned, we passed over an almost imperceptible watershed down a narrow stony valley to the village of Kaju. We had had a magnificent view from a hill a few hundred feet above the pass of the main Himalayan range. Mount Everest stood up towering above the rest of the range in its neighbourhood in one isolated peak, a continuous drop of some 8000 feet separating it from the rest of the range east and west of it. The village of Kaju (14,800 feet) lies on the edge of the Sutso Tang plain, which takes its



name from an old ruined fort on a small eminence in its centre. It is here about 5 miles wide, and we could see it trending away southwards and joining the Dingri maidan, which lies north of Mount Everest. A day's halt here enabled me to cross this plain, from the hills on the western side of which I obtained an uninterrupted view of Mount Everest, no hills intervening. I was thus able to satisfactorily establish the fact, which I had suspected a year before at Kampa Dzong, that no peaks anywhere approaching the height of Everest exist to the north of it or anywhere in its neighbourhood; it stands alone in its magnificent solitude, and is entirely disconnected from the mass, to the west of which Peak XX. (Gaurisankar) is the best-known point. On the south-east of Everest, but separated from it by a low gap, lies Peak XIII. (Makalu). We were here in the valley of the western branch of the Arun or Kosi river, but, recrossing the watershed next day by the Sheru La (17,600 feet), we once more reached the banks of the Tsangpo on November 5. The scenery was now changing; trees we had said good-bye to some marches back, our last cultivation we passed that day, while the hills were becoming more open and the plains abounded in sand-dunes. Brushwood was in places available for fuel, but we preferred argol, or dried yak-dung, as it gave greater heat, and, if the fire was carefully looked after, less smoke. During the whole of this portion of the river journey we had seen no four-footed game other than numerous hares, and a few gazelle on the Sutso Tang plain, but birds we saw and shot numbers of, Tibetan partridge, ramchikor, and Tibetan sand-grouse giving us a welcome change in our otherwise monotonous fare of mutton.

On the 6th we crossed to the north bank of the river with the utmost difficulty; a crazy-looking punt, manned by lamas, took us across in detachments, but, owing to the masses of floating ice whirled down the river by the rapid current, the punt was repeatedly forced back, and only reached the opposite shore after floating down some 400 yards, the operation of hauling the boat up again to its original starting-point against the ice being very hard work. On the 9th we arrived at Saka Dzong, a small village, and found that Captain Wood's party had reached there two days previously. We gave ourselves another day's halt here, as there was a good deal of surveying to be done in the neighbourhood.

Captain Wood writes as follows, regarding his journey:—

"Leaving Lhatse on October 26, we crossed the Tsangpo about half a mile below the town. A couple of boats had been collected by the Tibetans for ferrying across our kit and transport, but the process was very much shortened by the discovery of a ford about a quarter of a mile up-stream, by which the ponies were able to cross. After keeping to the north bank for about 10 miles, we turned up a side nullah and camped at Sanggelung village; following this nullah next day for a

distance, we crossed by an easy pass into a country the drainage of which led into a succession of small lakes, whose surfaces were dotted with geese and duck. On the largest of these, the Ngap-ring-tasam, or stage-house, is situated, which place we reached in the evening, and, hearing that no grain would be procurable until we reached the next stage, on the Mansarowar lake, we bought all we could procure, but

this would only give our ponies a couple of days' rest daily. The next day we passed Ralung, the place where we saw cultivated fields. Every day now found us at a higher altitude, as we were marching more or less along the watershed of the Tsangpo and its tributary, the Raga-tso. The valley of the latter stream is narrow, running almost due east and west, parallel to and about 30 miles to the north of the main river. Into this narrow space is crammed a dense mass of hills, whose average height is about 18,500 feet, with several peaks of over 22,000 feet, covered with permanent snow. A part of our march was especially unpleasant, owing to the strong wind on the hills, which was dropped by day by heavy rain of hurricane force, and, at elevations up to



TOMB OF ONE OF THE TASHI LAMAS. TASHI LHUMPO MONASTERY.

10,000 feet, the change in temperature from the comparatively warm valley of the Tsangpo was most noticeable. The hills, clothed with a dense grass on their lower slopes, but quite bare above 17,000 feet, were, as a rule, easy to climb; and from the summits lovely views of the surrounding mountains were obtained, Makalu and Everest, both standing out as isolated peaks, being particularly imposing. The tasams, at intervals of every four or five days we changed our yaks for fresh ones, were everywhere the signs of habitations we met with, and these, as a rule, consisted of one or two, with a mud hut or two. The marches were all long and monotonous in their monotony, and, owing to the narrowness of the valley.



valley, Ram Singh and I, to carry on the survey, had to climb to the crests of the range every day, seldom getting into camp before sunset, and on one or two occasions not arriving before nine or ten at night. On November 5 we crossed the Ku La (16,700 feet), situated at the headwaters of the Raga Tsangpo, and by a steep descent dropped into the valley of a small stream draining into the Tsangpo. At that night's camp we received letters from Captain Ryder, saying that he would arrive at Saka Dzong on the 9th. Passing under the snowy range of Chour Dzong, whose peaks range up to 21,000 feet, we reached Saka Dzong on November 7."

During our halt at Saka Dzong, Captain Wood ascended a high peak to the north (19,300 feet), from which he had a fine view north up the valley of the Chata Tsangpo, a tributary of the main river.

Saka Dzong has only a dozen or so houses, very dirty, the neighbourhood (height 15,150 feet) being, like that of every Tibetan village, a dust and refuse heap. We left on November 11, again in two parties. This time Lieut. Bailey accompanied me back to the river, while Captains Rawling and Wood followed the main route. That day we forded the Charta Tsangpo, a fair-sized affluent of the main river, and, crossing some low hills, reached the Tsangpo on the 12th, crossing the same evening late, it being necessary to do so then, as from my previous experience I knew that the river would be nearly impassable in the morning from floating ice. We crossed in a small skin-boat, our animals fording higher up. For several days we marched up-stream in a broad valley covered with low sand-dunes and stones, with a very small quantity of poor-looking grass, on which, however, kyang and gazelle seemed to thrive. The track followed by the Pandit Nain Singh, as he marched up from Nepal to Tradom in 1865, joined in on our left, but in these plains in Tibet it is difficult to find any signs of a path, as every caravan meanders over the plain without keeping to any defined track.

We recrossed the river on the 16th; but now it was completely frozen over, and we crossed on the ice, the only thing necessary being to make a good track for the animals by throwing some earth down on the ice. That evening we arrived at Tradom, where we found the rest of the party had arrived on the 14th. The weather had been taking a turn for the worse: low temperatures at night we always had, cold winds in the day were the rule; but if the days were sunny, a little walking would soon make us warm. When the days were cloudy, however, there was nothing to counteract the cold, and a march was a most miserable performance.

Captain Wood writes: "On leaving Saka Dzong, our party kept down the valley till we reached the Chata Tsangpo, which we found no difficulty in crossing. The stream was at that time some 100 feet in width, with a depth of 2 feet, flowing in one channel, having just left

a very deep narrow valley to emerge into a plain of about 3 miles in width. Striking up a small side nullah, we followed it for 5 miles, and camped at the foot of the Lalung La. On this pass we first saw signs of *Ovis Ammon*, and from the information we received, this appears to be the eastern limit of their country along the road we had traversed. The road for the next three days—if it can be called a road—was the worst we met with, and consisted of large broken rocks set in deep sand; and to make us even more uncomfortable, the weather changed to snow, accompanied, as usual, by a howling gale of wind. Inhospitable as Tradom appeared to us when we first descried it, we hurried on as fast as our ponies would take us, to get within the shelter of its single stone house, where we might warm our frozen limbs over a yak-dung fire, and pity the remainder of our party, who had still another two days to endure before they could hope to join us."

Tradom did not tempt us to halt; it is a desolate spot, with a small monastery on the hill above, inhabited by only three or four monks, but from the hills to the north we had a fine view of a snowy range reaching an elevation of 23,200 feet. We accordingly left the next day, and, marching across the plain all day, camped amongst the hills on the far side. This plain is full of small ponds lying among sand-dunes, and there was an unpleasant tributary or two to cross, the water frozen at the edges for 4 or 5 yards, then a drop of 3 feet into icy-cold water full of floating ice, ending with a scramble out on the other side on to ice again.

We now followed the river valley for a week or so, always in the same large plains, until we could see the watershed range ahead of us, from the valleys of which innumerable streams issue to form the Tsangpo, the largest coming from a snowy range to the south-west. After enjoying some days of bright sunshine, the weather again took a turn for the worse, and we crossed the Mayum La (height 16,900 feet) on November 26, with a foot or two of snow on the ground. We had now finished with the Tsangpo, having surveyed it from Shigatse to its source. Our next point of interest was to be the lake region ahead of us. The day after crossing the Mayum La we camped on the northern shore of the Gunchu Tso, a lake 11 miles long by 2 or 3 miles broad, with an area of 22 square miles, completely frozen over, and having no outlet at all. Several *Ovis Hodgsonii* (*ammon*) had been shot before reaching the Mayum La, and we now came on large herds of Tibetan antelope, of whom we each shot several, and could have shot many more if we had wished, as they were very tame.

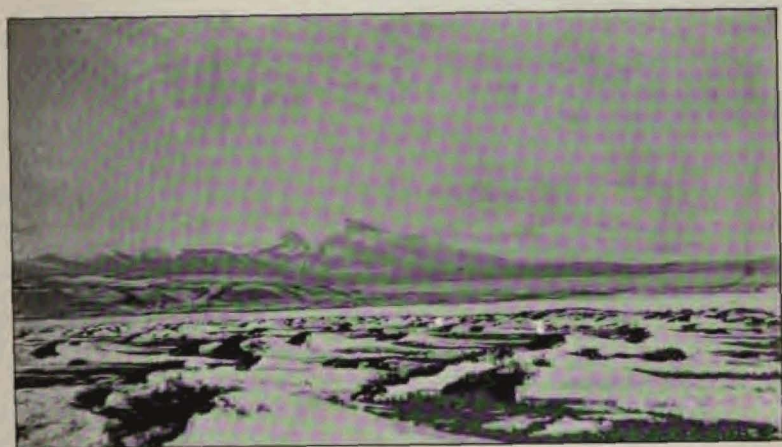
Crossing several low passes and generally undulating ground, we came in sight of the Mansarowar lake (Tibetan Tso Mobang) on November 30. The lake is neither impressive nor beautiful, like, say, the Yamdrok Tso, passed on the way to Lhasa. It was not frozen



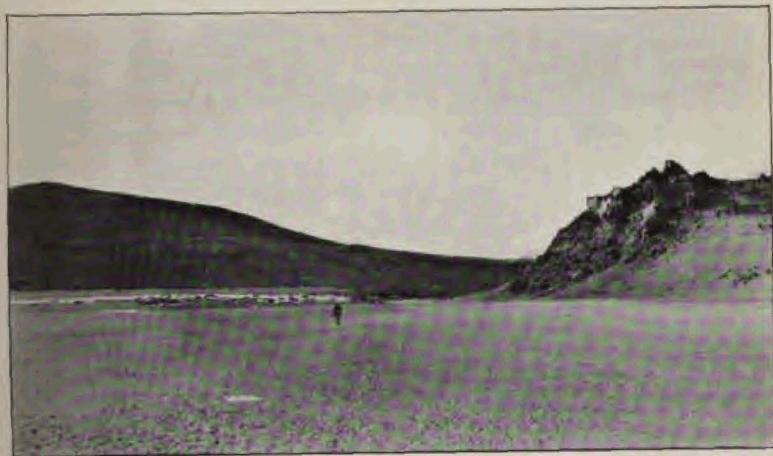
over, except for 100 yards or so round the edge; the water was fresh, and our surveyor, Ram Singh, on account of its sanctity, bottled some and carried it back with him to his home in Dehra Dun. Skirting the lake, we rode across the low hills, which close in on the western side, to look for the outlet, which Moorcroft had not been able to find, which Strachey had found, and which Mr. Savage Landor had claimed to have proved did not exist. We struck the channel a mile below the outlet, a small stream only partly frozen over; this we followed up, and found that it did not flow from the lake, but from a hot spring, at which we found and shot some mallard. We then followed up the dry nullah to the lake, and proved that Strachey was, as was to be expected, quite correct. No water was flowing at this time of year, but the local Tibetans all agreed that for some months in each year there was a flow during the rainy season and the melting of the snows, *i.e.* about from June to September. As a rise of about 2 feet in the level of the lake would cause water to flow down the channel, this appears quite worthy of belief. The length of the channel between the two lakes is about 3 miles. That day, December 2, we reached a Tibetan stage-house, and next day had a long day's ride to try and discover an outlet for the second lake, the Rakas Tal, or Tibetan Lagang Tso. This lake is very dissimilar to the Mansarowar in shape, and was entirely frozen over. The latter is about the same width, 12 miles north and south, as it is east and west, with an area of 110 square miles; the former is a long narrow lake running north and south, some 16 miles long by 3 or 4 miles wide, with an area of about 55 square miles.

It is the sacred character of the Mansarowar lake rather than its size which has made it well known; its height above sea-level is 14,900 feet. We found an old stream-bed issuing from the Rakas Tal, but every Tibetan we asked told the same story—that no water ever flowed along it now, but that in days gone by, one man saying before the Sikh war, water did flow out of the lake and down this channel. We followed it down for some 6 miles along the plain, and could find none of the ordinary signs that water flowed down it until we reached some low hills; here evidently, from the lie of the sand, water flowed at some time of the year, and away from the lake. The lakes being now entirely disconnected at all times of the year from the Sutlej river, the sources of that river must lie in the hills on either side of the valley and west of the lake region.

The Kailas peak was very prominent on the hills to the north, snow-covered, 21,800 feet in height. The strata forming the mountain are horizontal, which gives it a peculiar appearance; from the side we saw it, the top was quite inaccessible. There are several monasteries on the path which pilgrims follow in circumambulating the mountain. A very fine snow-mass, culminating in a peak over 25,000 in height, Mémor Gurla Mandhata lies to the south of the Mansarowar



MANSAROWAR LAKE.



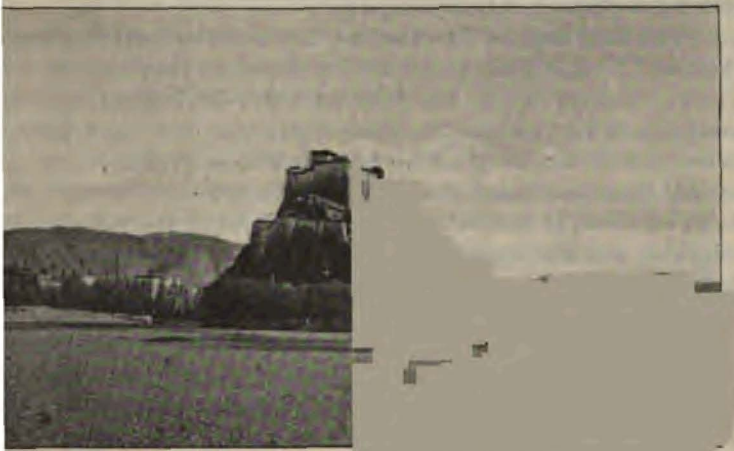
CHANNEL CONNECTING THE MANSAROWAR WITH  
THE RAKAS TAL LAKE.





A low watershed south-west of the lake leads to Purang or Kot.

Following to the north side of the broad open valley in which the snow-melting flows, we arrived at another stage, Menzé or Missar, on the 5th. Here we divided, sending our heavy baggage down the valley with Ram Singh, as I wanted him to continue the survey of the Sutlej valley while we went into Gartok. We were pleasantly surprised to find the Jerko La, the pass on the Sutlej-Indus watershed, so easy (height 16,200 feet), and without difficulty reached Gartok (height 15,100 feet) on the 9th. This is the summer residence of the Garpons; the two Garpons, the joint governors of Western Tibet, were



THE VILLAGE OF DZONG, THE LAST LARGE VILLAGE EN ROUTE FROM SHIGATSE TO GARTOK.

at Gargunsa, the winter residence, some 30 miles down the valley, but had come up to receive us.

We only halted one day at Gartok; in that time we had seen more of it. We were unanimous in looking on it as one of the dreariest inhabited places we had struck in our journey—a long, flat plain, absolutely bare, with a dozen wretched hovels in the distance, constitutes at this time of year what is in summer the chief trading centre of Western Tibet; but in summer traders are said to come in large numbers, living in tents. The wind howled round us as we were in continuously, and, the weather looking threatening, we were not anxious to stay a minute longer than was necessary for Rawling to settle up trade questions with the Garpons. Having now accomplished the main object of our journey, it only remained for us to get back into India as soon as possible. Fortune favoured us so far, but we had some high passes to cross. The



first of these was the Ayi La, height 18,700 feet. Two marches took us to near the top of the pass, encountering a blizzard the second day. That evening we saw the only herd of wild yak we had come across in our journey. Crossing the pass next day was no easy matter; the ascent was gradual, but there were 2 feet of snow on the ground, and a bitterly cold wind was blowing. It was with the utmost difficulty that, under some shelter from a rock, I took boiling-point observations and with a sigh of relief hurried down the other side. One of our chief obstacles was surmounted. It began snowing on the pass that evening, so we had only just crossed in the nick of time. At Dunkar (14,100 feet), where we camped that night, we met cultivation for the first time, and it was a pleasant sensation to feel that we were gradually coming to the end of high altitudes.

From here Captain Rawling and Lieut. Bailey next day marched to Totling (Tibetan Tuling), on the Sutlej, where they met Ram Singh's party. Captain Wood and I halted a day at Dunkar, and marched next day to Tibu, where the whole party was once more united. We were now in the most out-up country I have ever seen; it must resemble the loess formation of China. The bottom of every nullah was some hundreds of feet below the general level of the valley, with the edges so cut and worn into fantastic shapes that it was difficult to believe that one was not looking on the ruins of old castles. There are also innumerable caves, in which the inhabitants live.

On December 16, at Kyinipuk, we met Thakur Jai Chand, who had been sent up to be our trade agent at Gartok. He brought with him some very welcome newspapers. I must own we none of us envied him his job for the winter.

Each day's march now consisted of climbing up out of a deep nullah and down again into the next. We crossed the Shiring La (16,400 feet) on the 21st, in deep snow, with great difficulty, the descent on the western side being very bad going. Next day we camped at Tyak, on the Sutlej, which had been flowing on the left of our route only a few miles distant, but invisible to us owing to its being the bottom of a deep gorge. On the 23rd we marched to Shipki, crossing the river on the ice, elevation 9300 feet. On Christmas Eve we surmounted our last obstacle, the Shipki La on the frontier, a climb of 5000 feet, mostly in snow, and a drop of 6000 feet on the other side, camping at Khab, in British territory. From here we had eighteen marches into Simla, finding bungalows at every stage on and after December 28, finally arriving at Simla on January 11.

The area we surveyed with the plane-table comes to about 40,000 square miles. We surveyed the Tsangpo from Shigatse to its source, surveyed the Mansarowar lake region, and settled the doubtful points connected with it, which have been the subject of much discussion; we completed the survey of the Sutlej river from its source to where it

enters British territory, and surveyed the source of the Gartok branch of the Indus.

The triangulation, which is still under computation, was invaluable to correcting the plane-table work and fixing many heights.

The cold we had to contend against was at times very severe; the lowest minimum we recorded was  $-24^{\circ}$  Fahr., but as the thermometer always registers its lowest on clear, still nights, it is not a good guide. It may be generally said that when the air was still the cold was quite endurable, and on sunny days, out of the wind, no climate could have been pleasanter. When, however, the wind blew, which, I am sorry to say, was generally the case, no clothing ever invented was sufficient to keep one warm. When a hurricane occurred on a cloudy day, our surveying was done with lightning rapidity, our great object being to hurry on to the friendly shelter afforded us by our tents; but the constant change of scenery, and the interest of our journey, did much to counteract the discomforts we met with.

My companions will agree with me that the success attending our journey was in the first place due to the friendly attitude of the Tibetans, induced by the cordial relations which Sir Frank Young-husband had established with the Lhasa Government. We were indeed glad to be able, by only two or three months' hard work on our part, to prove that the treaty signed at Lhasa was not merely a paper one, as might so easily have been the case, but that it inaugurated an era of truly friendly relations between ourselves and the Tibetans.

I am greatly indebted to my companions, Captain Rawling and Lieut. Bailey, for the ready assistance and hard work they underwent in furthering the survey work, in which Captain Wood and our native surveyor, Ram Singh, proved themselves sterling workers.

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NOTE.—The lecture was illustrated by lantern slides from photographs taken by Mr. J. C. White, Mr. H. H. Hayden, Captain C. G. Rawling, and the lecturer.

Before the paper, the PRESIDENT said: We have to welcome this evening Major Ryder, on his return from a most important and interesting journey in Tibet. I need not introduce Major Ryder to the meeting, because he is an old friend, and most of you will remember the interesting paper he read a little more than three years ago on the subject of his survey with Major Davis in Yunnan. I call upon Major Ryder to read his paper.

After the paper, Sir FRANK YOUNGHUSBAND: Major Ryder has very gracefully acknowledged that the success of his expedition was due to the friendly relations which I, and he might have added which General Macdonald and every officer and man in the force, was able to establish with the Tibetans, and that is all the more satisfactory because it was no part of the treaty that this expedition should take place from Sbigatse to Gartok. It is, however, only a contributory factor to the success of the expedition, and the expedition would never have taken place at all if the idea had not originated in the fertile brain of Mr. Louis Dane, the Secretary of the Government of India, in the Foreign Department. He it was who first put this idea into my head, and after I had thought it over and



considered the *pros* and *cons*, I put it to the Tibetan Government, and was able to obtain from them consent for it to be undertaken. However, even then, with the idea originated and with the approval of the Tibetan Government, little would have come of it if we had not been able to obtain the services of really efficient agents and, fortunately for us as a nation, we can always lay our hands upon almost any number—certainly in Tibet there were dozens of men who have, not merely physical energy, nor merely animal courage, nor merely professional zeal, but, in addition to all these, that good heartedness and a capacity for getting on with all kinds of people, and tactfulness, which enables them to carry an expedition to countries which, but for this tactfulness, it would be impossible to penetrate at all. Among such men was Major Ryder, who on a previous occasion had travelled for two years in Western China, and had, in the service of the Government of India, surveyed in Burma and in many other places upon the Indian frontier. He had lived with me for many months in Tibet, and I had there seen and been able to test his great industry and his capacity for surveying, and his thorough zeal in whatever he undertook, whether it was the management of the mess, or, as he had to do at this time last year, organize the defences of a post as we had to at Gyantse in the face of the enemy. An equally good man was Captain Rawling, who had, in the year previously, made an excellent expedition into Western Tibet, and had there by his tact been able to get himself out of some exceedingly nasty positions in which he found himself at a time when the Tibetans were not altogether friendly with us. Captain Wood and Lieut. Bailey were similar men, and it was due to their tactfulness that this expedition has been able to get through successfully and leave a good disposition behind them which will enable future travellers to fill in, I hope, a great deal that is still left to be done. It was due to their tactfulness that they were able to get this expedition through. I need not, however, say that sending this expedition caused all those who had originated it a great deal of anxiety, for we were close on to winter. As soon as negotiations were far enough advanced for me to be able to put the matter before the Tibetans I had done so; that was well on to September, and after that the approval of the Government of India had to be obtained, and the time was passing by till it was on the verge of winter when the expedition set out. This was one cause of anxiety. Another cause was that, just as the troops were being withdrawn from Tibet, it could hardly have been taken as the precise moment in which to launch an expedition 800 or 1000 miles into the unknown. It was, however, with immense relief that we heard of the safe arrival of this party in India. They had gone all the way from Lhasa either on foot or on ponies, they had surveyed the whole way under the difficulties so well illustrated in Major Ryder's lecture and in his slides, and they had come out successfully. This would have been a magnificent performance if it had been undertaken in the very best of weather, and at a time when we could count upon the absolute friendliness of the Tibetans; but that it was done at the very worst season of the year, and at a time when we could only hope for, but feel no assurance in, the friendly disposition of the inhabitants, I think shows that Major Ryder and his companions have done a work which has most thoroughly earned for him the highest honour of the Royal Geographical Society, which we are all very glad to hear has now been awarded him. I only hope that no less award will some day come to his leader, Captain Rawling. We must all congratulate Major Ryder and his companions most warmly on the success which has attended their efforts, and I am sure at the conclusion of this meeting we shall all join in thanking him for the very valuable paper he has read to us, and for the very striking photographs he has been able to put upon the screen.

Brigadier-General Sir RONALD MACDONALD: I am afraid I have very little to

to add to what Sir Frank Younghusband has already said. I can only say I do not think that Major Ryder in any way exaggerated, in fact he did not quite sufficiently draw attention to, the dangers that he had to face on this expedition. Sir Frank Younghusband has referred to the fact that the treaty had only lately been made, and although he had been very successful in leaving behind a feeling of respect, and I might almost say admiration, for our justice and methods, and had shown even the dawn of friendship with Tibet, yet it was a very big risk to take with a small body of officers with practically no escort, to trust themselves to the Tibetans on a journey of this length. I think I may almost say the dangers of the winter were in no wise exaggerated. During the present winter we had three times the snow on the pass that we experienced during the expedition, and there can be no doubt that had Major Ryder's party been a little later, he would have had to winter at Gartok instead of being here. I can speak myself on the work he did. At first the work was with the mission under Colonel Younghusband, and I have no knowledge of his work while he was at Kampa Dzong; but when the survey was transferred to the force I had the honour to command, I can testify to Major Ryder's zeal in his geographical work, and to the loyalty with which he carried out the necessary plans and subsidiary work which were essential from a military point of view. As regards his work at Gyangtse when the mission was beleaguered there, every one who has seen it has admitted that it was high-class field engineering, and there is no doubt that what he did in the way of defending the post added greatly to the comfort of those who had to undergo the unpleasant experience of sitting there waiting. While we were at Lhasa I am afraid I had somewhat to curtail some of Major Ryder's more ambitious schemes for extending his survey. But circumstances would not admit of that; but even so, I think that when all the results are compiled they will show that he has a very solid mass of work behind him which will add largely to our knowledge of a little-known country, and I cordially agree with Sir Frank Younghusband that Major Ryder is a credit to the corps of Royal Engineers, and thoroughly deserves all the honour which the Royal Geographical Society can show him.

Colonel GORE: As the person responsible for selecting Major Ryder to go on this mission, it has given me great gratification to hear of the splendid success which has attended the work of the survey. Major Ryder has given us a very modest account of what is, I think, the most wonderful bit of surveying that I can call to mind. Nobody but a surveyor who has taken part in that sort of work, and under those difficulties, can thoroughly realize what it means to carry on a continuous running triangulation in a mountainous country of that nature and under those climatic conditions. The day is always too short for the work to be done; the cold is such that the fingers get numbed and refuse to do their work, and one's moustache, if one incautiously bends low enough to touch the instrument, freezes on to the theodolite instantly. The problem of surveying in Tibet has always been a very difficult one for us in India. For mapping the greater and more important part of the country, we have had to depend on the work of native explorers sent in disguise, and this expedition has been particularly interesting to us, as it has given us the first opportunity we have had of testing the work done by these native explorers, and I am greatly pleased to hear of the accuracy of so much of their work. For many years no European or native of India proper has been allowed to enter those parts of the country, and so we have had to try and get natives from the borders of Tibet who can talk the Tibetan language, and were sufficiently Tibetan-like in appearance to be able to penetrate the country, and then teach them sufficient rough surveying for our purpose. The Tibetans, however, have always looked with great suspicion on such men, and even so regard



those border merchants who habitually cross into Tibet for trade purposes. Our trouble has always been to get border men who have sufficient intelligence to pick up enough surveying to do any good. I thought at one time of attaching these men to regular survey parties for a while, so that they might learn something of real topographical surveying in order that they might carry out their exploration work more intelligently, but I found that a course of survey work so smartened them up and made them so clean that there was no chance of mistaking them for Tibetans. We used to teach them to use a small hand-compass, which they could conceal in the palm of their hand, and they paced their distances, and the more experienced of them could take a latitude with a small sextant. Though, properly speaking, they could not map, they kept a field-book in which they recorded their observations, and a note-book in which they jotted down what sort of things occurred to them; but the sort of things that occurred to them would never occur to a man who wanted to make a map. It was all very well when you had an honest man, because he would do his best, and when he came to a difficulty he would own up and tell you of it, and then you made the best of it. But for the few that the Geographical Society knows of, there have been many who have been hopeless failures. I remember a man who went across the frontier who had had a large amount of training. He came back nine or ten months afterwards, and we were delighted to get hold of his field-books, and we started to see what we could make of them. The first thing that struck me was that they were a great deal too clean; they were nicely drawn out with headings and columns and so on, and it looked rather suspicious. He declared they were his originals, and so we went on and made the best of them. His work, however, did not fit in well, and it was out a good bit, and his latitudes would not fit in with the other work. And then I examined his field-book more closely, and I found he had got all his bearings down in the first column very nicely, but they had been put in as an old-fashioned seaman would put them in, in points. The second column was prismatic compass bearings, but a glance at them showed they were simply obtained by multiplying each of his double points by  $22\frac{1}{2}^{\circ}$ , and that man swore he had taken them with the prismatic compass. His uncle was an old and honoured explorer, and what I am afraid was the case was that when he came back from his trip he went to his uncle's house, and between them they made up a new field-book. The work went the way of a good deal more: it found its way into the waste-paper basket—at least, it is lying in the office unused. Another man went round the great bend of the San-po, where that river turns south towards India, and penetrated southwards to the limit of the Tibetan country. He was then caught by the Tibetans and taken back through the lower part of Tibet bordering on Bhutan, and then set free. He brought back his work, but it proved to be useless and was not utilized, so that part of the course of the river is still a matter of some uncertainty. I think that Major Ryder and Captain Rawling have done a very wonderful survey, and they deserve every honour that can be conferred upon them.

Mr. DOUGLAS FRESHFIELD: I shall not detain the meeting this evening more than two minutes. There are certain remarks I might have made on the printed paper, but they are more the remarks of a geographer than those of a traveller, and they would refer to technical points which I think it would be unsuitable to bring forward in this meeting. I will only congratulate Major Ryder on having done one thing which will be very welcome to all mountaineers, and still more welcome to all schoolboys, as that is proved there is not to be a new highest mountain in the world—that the one which we have believed hitherto to be the highest still remains the highest. I would like to warn him of one thing. He spoke of it as "Everest." I hope the word "Mount" will not be habitually left out, and I will tell you the

reason why. A misguided friend of mine, a Fellow of the Royal Geographical Society, went to the backwoods of North America and discovered some new peaks among the Rocky mountains, one of which he called Mount Freshfield. He went back again next year, and found it easy to climb, and then he wrote "Freshfield has proved somewhat of an impostor." I hope this may never happen to Colonel Everest.

**THE PRESIDENT:** Captain Rawling and Captain Wood are present, but I will not call upon them. We know what splendid work they both did, and we have seen their photographs, hard at work on the top of very breezy rocks. The Council, I am sure, will be as glad as I am to find that our opinion has been so fully corroborated by Sir Frank Younghusband, Sir Ronald MacDonald, and Colonel Gore, regarding the merits of Major Ryder and as it will be my duty this day week to express the Council's feelings on that subject, I need say no more now. But before closing the meeting, I cannot help saying how pleased I am to find that our Gold Medallist Nain Singh, and the other pundits sent by General Walker and Colonel Montgomerie forty years ago, were as accurate in their observations as they were courageous and loyal to their employers. I will now ask the meeting to pass a cordial vote of thanks to Major Ryder for the admirable paper he has read to us, and for the illustrations he has shown us.

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## ON THE NILE FLOOD AND ITS VARIATION.\*

By Captain H. G. LYONS, F.R.G.S., F.G.S., Director-General Survey Department, Egypt.

*Nile Gauge Records.*—The data available for a discussion of the Nile floods are not inconsiderable, but the greater part of them are, unfortunately, of very unequal value on account of the irregularity of the readings at the Roda nilometer,† and of the falsification of its records, which is stated to have taken place in earlier times in order to increase the revenue. They may be summarized as follows:—

1. Readings of the Roda nilometer from 700 A.D. to 1903, but the readings for many years are missing.
2. Readings of the Nile gauge at the Delta Barrage from 1846 to 1878.
3. Readings of the Nile gauge at Aswan from 1869 to the present time.
4. Readings of the Nile gauge at Wadi Halfa from January, 1890, to the present time.
5. Readings of the Khartum Nile gauge from 1869 to 1883, and from 1900 to the present time.

The Aswan series of gauge-readings is the most complete, and will be used as the basis of this discussion. At the present time it may be considered that the Aswan dam, though its open sluices admit as free a

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\* Continued from p. 272. Diagrams, p. 368.

† At Cairo