

Peary, and I think he well deserves the devotion and loyalty that he has secured from them.

You will wish, I am certain, to pass by acclamation a vote of thanks to Lieut. Peary for this most interesting account of his journeys, and for the extremely beautiful illustrations he has provided to-night. You will also wish to pass an expression of your earnest wish that he may be successful in the grand undertaking before him, and which he has sketched out to you. I have to express to you, Lieut. Peary, the thanks of the meeting for your paper and illustrations.

Lieut. PEARY: I can only say I thank you sincerely for your appreciative interest. I felt from the first we were in sympathy; I know it now. I thank you for your vote of thanks.

FOUR YEARS' TRAVEL IN CENTRAL ASIA.*

By DR. SVEN HEDIN.

IN such a short lecture as this, it is no easy task to give even the outlines of a journey of research which, during three and a half years, led us in innumerable bends and turns from the one end to the other of the greatest continent of the world, to give an account of the results gained and the observations made in different branches of science, or to describe the varying adventures to which a traveller cannot help being exposed on such a journey. I therefore beg you kindly to make allowance for the brevity to which I am compelled, and for the gaps which must necessarily occur on account of my dwelling on points of general interest. Thus I pass over the journey through the Kirghiz steppes and across Tashkend to Margilan.

After having crossed the Pamirs in the winter and spring of 1894, I undertook, in the summer and autumn of the same year, my first excursion to Eastern and Central Pamir, taking Kashgar as starting-point; in the spring and summer of 1895, a journey through the Takla-Makan desert and the north of Eastern Turkistan; and in the summer and autumn of the same year, finally a third excursion to the Eastern and Southern Pamirs. In the same way, I afterwards made Khotan my basis of operation, starting from this place in the beginning of 1896 on my long journey around Eastern Turkistan and to Lob-nor, and when I left Khotan at the end of June, 1896, I had "burnt my ships" in earnest, cut off all possible connections with the occident, and given up all hopes of renewing this connection before I had reached Peking in the far East.

It was a hard campaign which was begun on February 23, 1894, when, with a caravan of twelve horses and four men, I left Margilan to cross the snow-covered Pamirs by the tortuous mountain-path leading

* Read at the Royal Geographical Society, November 22, 1897. Map, p. 332.



SKETCH MAP
OF
CENTRAL ASIA
TO ILLUSTRATE DR SVEN HEDIN'S
JOURNEY 1894-97.

Route ———
Scale of Miles.
100 200 300
Nat. scale 1:10,000,000. or 1 inch = 160 miles.

across steep rocks, across rivers and gravel-pyramids, up through the Isfairam transverse valley to the crest of the Alai range. The first stages were easy, but higher up we cross the river time after time on trembling wooden bridges. The valley is narrow and picturesque; the silence is only disturbed by the shrill commands of the men, which give a ringing echo against the perpendicular rocky walls, and by the roar of the river below us. The caravan proceeds slowly up the dangerous path, which, scarcely a foot wide, runs along the very verge of the precipice. Still higher up, the path was covered with a smooth sheet of ice, and sloped towards the brink of the yawning gulf. The first horse was led by a Kirghiz, who was well acquainted with the way; but it slipped, slid down the sloping path, passed over the verge, turned several somersaults in mid-air, and was crushed on the slate in the bottom of the valley. Such smooth ice-coverings became quite usual higher up, and we were obliged to cut steps in the ice with spades and picks, and then strew sand on the steps. This took time. It got dark, and only the stars lit up the wild landscape with their pale light. The horses were led in single file. We slid, crept, and dragged ourselves along the edge of the precipices. After enormous exertions, we reached, a few days later, the crest of the Alai chain, in the Tengis-bai pass, 12,600 feet high, where the snow lay deep. The view from this point is delightful; we are surrounded by snow-covered ridges in all directions, but in the south-east we see in the distance the Trans-Alai range, with peaks which disappear in the clouds, and snow-fields of dazzling whiteness.

The Tengis-bai is one of the boundary-marks between the river districts of Sir-daria and Amu-daria. The southern slope is also steep, and we rode across one fresh avalanche after another. One of the largest, which was over 400 yards wide, had fallen the day before, and the Kirghiz congratulated us on having escaped its fury. The day after we had passed Tengis-bai, there was a violent snow-buran, and if we had been belated one day, we should doubtless have all been lost in the pass. Tengis-bai has given many a Kirghiz a nameless grave.

During the whole march through the Alai valley we had deep snow, and were obliged to have four camels led in front of us to tramp down a path through the snowdrifts for the horses. Once we were stopped by a gully about 150 yards wide, in which the snow had drifted to a depth of 10 feet. We could not cross except by having the Kirghiz spread felt mats on the snow and letting the horses walk on the mats, which were moved forwards, the one after the other, until we at last reached the other side after many difficulties. The cold was severe, and the temperature sank on March 6, at Urtak, to 30° below zero Fahrenheit, while we were not able to get up the temperature in the tent higher than 24·8° below zero, although the tent was full of Kirghiz.

In the Alai valley, about 250 yards from Kipchak, Kirghiz pass the winter. Near the end of May, when a rich growth of grass succeeds the snow, there is life in the valley. All the rich Kirghiz of Ferghana then come here with their herds, and make their "yeilaus," or summer camps, on the banks of the Kisil-su. They then perform their "baygas," or games on horseback, invite each other to feasts, celebrate marriages, and enjoy their summer in every possible way.

The climate has also its peculiarities—the sun burns one in the face on one side, while on the other one is near freezing. At midday on March 5 the thermometer showed in the shade 14° Fahr., but the insulated thermometer showed 125° . A range of 100° in six hours are very usual during the winter. The lowest temperature which I observed was on the night of March 10 at Koksai, namely, -36.5° Fahr. After the skin has changed a few times, the face becomes copper-coloured, and as tough and dry as parchment. Moist food dries up to stone, preserves freeze to chunks of ice. The greatest danger in crossing the Pamirs during winter is the snow-burana. If the caravan is overtaken by one of these burans, it is necessary to keep close together, for if any are separated from the main body, it is impossible for them to make themselves heard above the howling of the storm either by shouting or firing off rifles, and they are lost and freeze to death. Thus we always camp when the storm comes on.

Crossing the Kisil-art pass in the Trans-Alai mountains, we reached the Great Kara Kul on March 10. For two days we marched across its ice-covered surface, and I sounded its depth in seven places, and found it to be at the most 756 feet deep in the western basin. In the Mus-kol valley we found two very peculiar ice-volcanoes, which were formed by spring water oozing out of the ground and freezing in layers, one of these being 16 feet, and the other 26 feet high.

On March 16 we rode in a blinding snowstorm across the Ak Baital pass, and, two days later, down through the Murgab valley to the little Russian fort, Pamirski post, where the Russian flag waves over the roof of the world. Here I was very politely received by six officers and 160 Cossacks, and had a pleasant rest after all my hardships.

On April 7 we broke up again, and rode across Rang Kul to the Chugatai pass, where we cross the Chinese frontier. We had five days' marches to the frontier fort, Bulun Kul, where Yan-darin was the commander. Wild reports in regard to my approach were already circulating here. It was said that I was escorted by sixty Cossacks armed to the teeth; my tent was surrounded at night by Chinese guards; they even insisted upon opening the chests containing my luggage and provisions, in order to be sure that I was not smuggling Russian soldiers across the frontier in them; and the Kirghiz were forbidden to supply me with mutton and other necessary articles. After

many "ifs" and "ands," I was given permission to visit Mustagh-ata. I had only time, however, to do some preliminary work, when, after an attempt to ascend the mountain which was frustrated by a snowstorm, I was attacked by inflammation of the eyes, which compelled me to hurry back to Kasbgar. During the summer and autumn of 1894 I continued my researches in Eastern Pamir; but I will pass by them in silence, in order to say a few words about the magnificent mountain which so captivated my interest.

As Mount Demavend plays an important part in the popular fancy of the Persians, so in the eyes of the Kirghiz does Mustagh-ata, as it is enveloped in a mysterious shimmer, and is clad in a variegated mantle of



MY TARANTASS IN THE KIRGHIZ STEPPE NEAR LAKE ARAL.

fantastic traditions and legends. They look upon Mustagh-ata as a holy mountain—a *masar*, or grave of saints—where seventy-two saints are buried, and among them Moses and Ali. They tell that only an old *ischan*, or holy man, had, in ancient times, ascended to the top of this mountain, where he found in a garden a white camel and old men in white garments and with long white beards; and they believe firmly that there is a city, which they call Yanaidar, whose inhabitants are absolutely happy and possess all the enjoyments of life; where a perpetual spring prevails, where the gardens always bear fruit, and where the women are beautiful and never grow aged. They declared that the mountain could not be ascended, abysses and acclivitous slopes preventing any progress, the cliffs being covered by ice as bright as

steel; and the wind—the sole master of the region—would sweep us away like grains of sand, we were to attempt to set the giant at defiance.

Like a mighty outpost against the Central Asian deserts, the *Mus-tagh-ata*, one of the highest mountains of the world, and surely the highest of the Pamir, rises 25,590 feet, and is at the same time a worthy continuation of the tremendous ranges—the Himalaya, Kuen-lun, Karakoram, Hindu-Kush, which meet here on the roof of the world. It constitutes the culminating point of the meridional chain which brings the Pamirs to an end in the east, and is called *Mus-tagh*, or the ice mountains, and the name *Mus-tagh-ata*, or the Father of the ice mountains, points at once to its superiority.

If *Mustagh-ata* formed a regular cupola, it would even then, according to the laws of nature, be encased in ice-armour covered with snow and *névé*, and this ice-armour should, in zones, have the same thickness if we disregard the climatic factors. In reality, however, the irregular form of the mountain enjoins quite a different distribution of the masses of ice. Generally speaking, the higher regions of the mountain are, to be sure, covered with an enormously thick mantle of ice, which stretches out its apophyses-like tentacles to the depressions of the *névé* basins and the glacier passages, but its thickness and extent are very uneven on the different slopes. The north top, which I ascended 19,653 feet (about the height of the summit of Kilimanjaro), on August 6 and 16, was at this altitude covered with a layer of *névé* and newly fallen snow $1\frac{1}{2}$ foot thick, which lay immediately on weathered rock bottom. The case is quite different further to the south, as I found in attempting an ascent on August 11 with six Kirghiz and nine yaks. Here we ascended on the western rocky crest of the *Chak-tumak* glacier to a height of 15,584 feet, where the rock disappears under the ice. At this height we can see two of the prominences of the armour-ice, the nearest of which possesses most of the qualities of an ordinary glacier. Its front wall is 20 metres (66 feet) high, and perpendicular, and at its base lie blocks of ice which have fallen from above; but there are no moraines. The snow-covered surface is cut up by transverse and convex crevasses, a brook formed by the melting ice runs down from the front. We afterwards continued our ascent on the ice, whose snow-covering kept the yaks from slipping, although the slope is 24° steep. Gradually we came into a system of parallel transverse crevasses at least 1 foot wide and 33 feet deep, but they were usually covered with snow, so that the yaks turned one somersault after the other. Higher up they became more scarce, but the snow increased. At a height of 18,537 feet, the first yak disappeared suddenly in a crevass, but fortunately fastened by the horns and one hind leg, so that by passing ropes around him and hitching them to the other yaks, we were able to haul him up. The crevass was $4\frac{1}{2}$ feet wide and 26 feet deep,

and its walls consisted of dull blue ice. A little higher up all progress was barred by a crevass 20 feet wide. The snow lay here nearly 2 feet deep; 650 feet above us rose mighty ice protuberances, with wild jagged forms, resembling walls, pyramids, and towers, frequently with vertical sides of clearest ice, otherwise covered with snow.

My limited time prevents me from describing our many glacier journeys. They were performed under very difficult conditions, for we had to work at a height which by 6560 feet exceeds that with which one is accustomed on the glaciers of the Alps. It would also have been difficult to stand all the hardships to which we were



KIRGHIZ WOMEN ON THE MURGAB.

exposed if it had not been for the tough and hardy yaks, which mounted to a height of 19,750 feet without complaining. I camped at several points at a height of about 14,000 feet, a height equal to that of the summit of the Finsteraarhorn, and from that made excursions. The glaciers which were specially surveyed were Gorumdeh, Sarimek, Kamper-kishlak, Jam-bulak, Chak-tumak, Tergen-bulak, and Chum-karkashka, while the two Kok-sel glaciers, Sar-agil, Shwer-agil, Aftab-urui, and Gerdumbek were only mapped from a distance. Jam-bulak is the largest, and has a breadth of half a mile and a length of $5\frac{1}{2}$ miles. I will not leave them, however, without mentioning some of the laws which govern them all. The glaciers of Mustagh-ata are all retreating. Old moraines, glacier clay, and erratic blocks extend in the north all the way to Basik-kul, and in the south to Kara-su. The position of the

glacier-fronts vary somewhat, however, with the seasons of the year, advancing a few yards in the summer, when the glacier movement is strongest, but retreating again in the winter, when the glacier movement almost ceases, and the fronts are constantly worn by ablation. In a couple of places I planted a chain of measuring-poles straight across the glacier, in order to ascertain the rate of its movement. I discovered the greatest speed at a point in the middle of the Jam-bulak glacier, which, from August 3 to 18, advanced $14\frac{3}{4}$ feet, or hardly 1 foot per day.

From north to south the glaciers become gradually smaller, but the old moraines become slowly larger, which depends upon the fact that the glaciers which have been most exposed to the sun have developed a higher speed. In the glaciers which run west, the left half is always higher and larger than the right half, since the shade afforded by the rocky walls on the south in some degree prevents the glacier from melting on this side; but after the glacier emerges from the rocky passage, its left side melts faster, on account of its being exposed to the sun on the south. The left and lateral moraines are always larger than those on the right. The central and front moraines are generally rudimentary. Nearly all the glaciers form at a certain height falls, which cause transverse crevasses; longitudinal and circular crevasses also occur. The angle of fall is always very sharp. On the rocky wall on the right of Chaktumak, I saw a very fine example of a falling glacier. The rocky wall is perpendicular, and rises 656 feet above the surface of the glacier, bearing on its top a spur of the ice, which gradually extends over the edge of the precipice, and occasionally breaks off in great blocks. These blocks of ice are crushed against the protruding rocks below to a fine white powder, which, like a waterfall, rushes down on to the surface of the main glacier, there to form a regenerated parasite glacier.

Mustagh-ata consists almost exclusively of gneiss and crystalline schists. The gneiss occurs in many and very beautiful varieties.

The melting brooks of the glaciers running west are accumulated by the Su-bashi river, which discharges itself into the Little Kara-kul, a pretty alpine lake which has been formed by a dam consisting of an ancient moraine. The northern brooks flow into the Ike-bel-su, a mighty rushing river in the summer, which, under the name of Gez-daria, cuts a passage through the Mustagh-ata chain in a deep cross-valley. The southern brooks join the Kara-su, one of the tributaries of Yarkand-daria. The great fall of hail and snow on Mustagh-ata, especially during the summer, when we had hail or snow nearly every day, has always one destination, namely, Lob-nor, no matter whether, during its metamorphosis, it is carried to the north or the south.

After having spent the winter in Kashgar, I again broke up camp in February, 1895, and started on my journey across Maral-bashi to

Merket on Yarkand-daria with two great *arbas*, or high-wheeled carts, which creaked and groaned under their heavy burdens. We had to cross the Takla-makan desert to Khotan-daria, a distance of about 200 miles, and I thought that I should find vegetation, springs, and perhaps traces of ancient civilization at the foot of Mazar-tagh, the mountain-range seen by Prjevalsky and Carey, which was supposed to extend straight across the desert. It was my intention afterwards to continue to Tibet, and we therefore had a very great amount of luggage—provisions, winter clothes, tents, weapons, ammunition, etc., and since we also took with us a supply of water for twenty-five days, our eight fine camels were heavily loaded when we left Merket on April 10, and



VIEW FROM THE MOHAMMEDAN TASHKENT.

started off for the unknown East. We had in our caravan, besides the camels, dogs, sheep, and hens, with a cock that woke us in time every morning. The first few days we found one or two eggs every morning in the nest basket, which was placed on the back of one of the camels; but when the water-supply began to run low, the hens left off laying eggs. At last I had four men—my faithful body-servant, Islam-bay, who accompanied me throughout the whole journey, all the way to Urga in Mongolia; Kasim, from Yarkand; Muhammed Shah, from the same town; and the desert-man, Kasim, who had frequently travelled in the desert in search of gold, like the rest of a whole tribe of good-for-nothing people living on the edge of the desert, firmly believing that they will sooner or later find great treasures hidden in the desert sands. In

some places the desert is called *Dekken-dekka*, because it is believed that 1001 cities have been buried in the sands. I heard of a man who had found a city, in whose houses Chinese silver yambans were lying in great heaps. He had taken with him as many as he could carry; but just as he was about to return with his plunder, a great flock of wild cats rushed out at him, and scared him so that he dropped his precious burden and fled for dear life, but he could never find the place again. In another city corpses had been found in a posture indicating that they had been suddenly struck dead while engaged in their daily occupations. I had an opportunity of hearing many just as comical and adventurous legends, which only increased the attractions of this dangerous journey. During the first thirteen days everything went off well, and we could get water every day by digging. It was brackish, to be sure, but it was good enough for the camels to drink. At last we really reached a mountain-range, which we took for granted to be the continuation of *Mazar-tagh*, at the foot of which there are two beautiful small lakes, which are plainly formed by some branch of the *Yarkand-daria*. In the reeds there were ducks and geese, and on the shores grew poplar, tamarisk, and kamish (*Populus diversifolia*, *Tamarix elongata*, and *Lasiagrostis splendens*). We rested here two days, and for a couple of weeks after we looked back to this place as a paradise.

On the 23rd we resumed our march. After two hours the mountain disappeared in the dust-filled air, and we never afterwards saw any traces of any *Mazar-tagh*, therefore the two mountains are isolated. Before us stretched the dreary but agitated desert sea, with dunes from 80 to 100 feet high. We rested at the last tamarisk, which the camels stripped of both bark and leaf. A well was dug, but we got no water. I had ordered a water-supply for ten days to be taken with us from the lake, but I found, after it was too late, that only a four days' supply had been taken. The desert man, *Kasim*, said that after four days we should reach a place where water could be had, and since his statement agreed with the maps which I had, I relied upon him.

The next day a violent west wind blew the sand in great clouds from the tops of the dunes, so that the whole horizon was quite dark. We had left the last stretches of clay ground behind us, and now everything was sand. The dunes lay north and south to a height of 150 feet. *Islam-bay* went at the head of the caravan with the compass in his hand, and had orders to keep due east, where *Khotandaria* should be nearest to us. We went in crooks and roundabout ways, in order to avoid the worst sand. The desert resembles a petrified sea with giant waves. Every morning the same desolate landscape spread out before us. Every trace of life was lacking. Not even a fly was to be heard in the air, not even a yellow leaf broke the monotony.

On April 26 we left two dying camels, with their empty water-tanks, to their fate. If we were saving, our water-supply would last

two days more, and we expected at any moment to find well-water; but this was a vain hope, and if we had had the least idea of what was to come, we should have returned to the little lakes. That evening we came to a small piece of clay ground between two dunes, and the men stripped off their clothes and took turns at digging a well with the courage of desperation. At the depth of one yard, the ground became damp, and our spirits rose. All the animals, even the hens, waited impatiently around the well, which was becoming deeper and deeper; but at the depth of 10 feet the sand again became dry, and the well was deserted in disappointment. The camels now had to eat up their



CROSSING THE ARIS RIVER.

saddles, which were stuffed with hay and straw, and then the whole supply of bread.

On the 27th we saw two geese flying towards north-west, and they fired our hope. I now went on foot all the time, in order to keep as straight a course to the east as possible. The sand did not decrease. Wherever the eye turned there were whole chains of dunes, in which one sinks and feels one's self held fast. We were as saving as possible with the water, and the animals did not get a single drop more, but in the evening thick clouds rose from the western horizon, and the tent was spread out on the ground. All the men stood in readiness to take hold of its corners if the rain should come, but this was also a vain hope, for the clouds blew over to the south-east without a drop of rain touching us. We did not pitch the tent any more, although the night air was cold, frequently being only a couple of degrees above freezing-point, while on

clear days the glass showed about 85° to 100° Fahr. When, on the 28th, we were awaked by a sandstorm, the whole camp was buried, and many objects had to be fished out with staffs.

During the march we were enveloped in a sandcloud so thick that it was as dark as night, and a dark, fire-yellow light filled the air. We were obliged to keep close together, for our tracks were instantly covered by the drifting sand, and if one of us had lost the others, he would have been lost beyond recovery. Only the nearest camel could be seen through the clouds of sand; no cry could be heard, nothing but a loud whistling and hissing sound reached the ears, as billions of grains of sand shot past. Perhaps it was that these sounds led Marco Polo to fancy he heard drums and squadrons of cavalry, of which he speaks in describing the horrors of the Lob desert. One of the camels stopped on a dune, and was immediately lost out of sight for ever. In the evening we left all the provisions, clothes, chests, etc., which we could possibly get along without. On the 29th we still had two quarts of water, but it was stolen the following morning. The camels were fed for the last time with the whole of our butter-supply. The end then began to draw near. On May 1 we were tormented still more with thirst; the men drank the camels' rancid oil, and I drank some Chinese brandy, which otherwise was used for a lamp-stove. This paralyzed my muscles, and I dragged myself laboriously along, far behind the caravan, ready to drop at any moment, in the burning rays of the sun. The bells of the camels could no longer be heard, but I followed the tracks, and after walking on about 3 miles, I found the others lying flat in the sand. A couple of them were weeping and calling upon Allah. Even the camels had lain down, tired to death and with outstretched heads. We had hardly enough strength to pitch the tent. We undressed, crept into the shade of the tent, and lay there all day. Not a sound was to be heard except the breathing of the camels, which broke heavily upon the silence. We slaughtered the last sheep, in order to drink its blood, but it was so thick and sickening that no one would taste it. The men put up with a drink of a still worse character, which was provided by the camels. It was mixed with vinegar and sugar, and doubtless hurried on the death of the desert man and Muhammed Shah. They got lost the same evening, and we never heard of them again. Even Islam wasted his strength in this way.

As the sun began to set, I felt myself entirely restored, and with Islam, Kasim, and the five camels, I left the miserable camp, where everything except my notes, instruments, money, and some other necessary things were left in the tent. In order to save my strength, I rode on a camel, but it soon became pitch-dark, and we could not see where we were going, but were constantly stopped by the dunes. I therefore lit a lantern, and went on foot to find out the best passage.

At midnight we had only gone $2\frac{1}{2}$ miles; one of the camels had been deserted and Islam was done for. Now that I saw the end was near, I decided to leave everything, took Kasim with me, and hurried to the east, after having encouraged Islam and told him to follow our tracks as soon as he was able to walk again. Thus we left the last fragments of our caravan in an Egyptian darkness. The lantern was left burning beside Islam, but its weak rays were soon hidden by the dunes.

I only carried the two chronometers, a watch, a compass, paper and pencil, a tin of lobster, and some cacao. Kasim carried a spade for well-digging, a couple of pieces of bread, the fat tail of the slaughtered sheep,



READY TO ASCEND THE MUSTAGH-ATA FROM YAM-BULAK, 14,500 FEET.

and a piece of coagulated blood. We did not derive much pleasure from these poor provisions, however, for the throat and all its mucous membranes soon get as hard and dry as the skin on the outside of the body, and it is impossible to swallow. The feeling of hunger disappears entirely on account of extreme thirst, which, especially during the first days, is so torturing that one is ready to go mad; but after the body has left off transpiring, a progressive debilitation sets in, which gradually leads to a crisis.

Meanwhile I hurried eastward with Kasim. We walked, with innumerable interruptions, all night. At 11 o'clock on May 2 it was so hot that it became black before our eyes, and we rested all the rest of the day. We undressed stark naked and buried ourselves in the

sand, with our clothes hung above our heads on the spade by way of protection from the unmerciful sun.

From six till one o'clock at night, we walked in the moonlight. After a short rest, we crept on over this ocean of fine yellow sand, which appeared to be endless. Suddenly Kasim stopped short on the morning of May 3, caught hold of my shoulder, and, with a blank stare, pointed to the east. I looked and looked, but could not discover anything unusual; but, with his falcon eyes, he had descried a green tamarisk, on which our hope of rescue was now concentrated, for its roots must reach down to water. When we at last reached the bush, we thanked God for his mercy, and I have never before so forcibly realized that the Mohammedans have the same God as the Christians. We rested a while, and chewed the juicy needles of the tamarisk like animals. It was the olive-branch which showed there was a shore to the desert ocean, an outlying rock which causes the shipwrecked seaman to hope that the coast is near. In the shade of another tamarisk, we rested all day, from ten till seven o'clock. In the evening we reached three fresh poplars, where we tried to dig a well, but were not strong enough; so we kindled a fire instead, in order to let Islam know where we were, if he should still be alive.

On May 4 we were discouraged again by the appearance of a high belt of sterile sand. During the hottest hours we rested again under the shadow of a tamarisk. When I dressed myself again at seven o'clock and encouraged Kasim to come on, he hissed out that he was not strong enough. I then continued alone until one o'clock at night, when I sank down in utter fatigue under a tamarisk. Some hours later Kasim came staggering up, and we continued together. After a short rest, we dragged ourselves along on May 5 with the waning strength of dying men; Kasim looked dreadfully giddy and confused. But at last our hope grew lighter—we saw a dark line along the horizon; it was the wooded banks of Khotan-daria! We walked into its leafy arbours, and realized that the river was near at hand, but were not able to walk any farther in the heat of the day, so we sank down under a shady poplar. At seven o'clock in the evening, taking the spade-handle as a staff, I crossed the wood, creeping long distances on all fours. Kasim remained where he was, lying on his back, motionless, with eyes wide open and mouth gaping, and he did not answer when I asked him to go with me.

Then the wood suddenly ended, and a plain, lit up by the pale rays of the moon, spread out before me. I at once understood that it was the bed of the Khotan-daria, but I found it dry, and waiting for the summer freshets from the mountain; but I did not think that I was doomed to succumb in the very bed of the river. I therefore crossed it, and with great difficulty reached the opposite bank, whose woods and reed thickets could be dimly seen in the darkness. It had taken me

five hours to go scarcely 2 miles. All of a sudden a duck flew into the air, water splashed, and I stood on the edge of a little pool of fresh, clear water, which was still left in the deepest part of the bed of the river, where the stream had last flowed.

I will not take up your time by describing my feelings, or what then happened. Let it suffice to say that, after I had drunk, I filled my boots to the very tops, passed the spade-handle through the straps, and returned to Kasim, who was thus rescued in the very last moment; but he was not strong enough to walk, and so I walked alone three days and two nights southward in the bed of the river, living on grass and tadpoles, until on May 8 I found shepherds, and was beyond all danger.



ON THE SLOPE OF MUSTAGH-ATA, 18,000 FEET.

Encouraged by our fires, Islam Bay dragged himself along to the river, leading the last camel, that carried my notes, some instruments, and our Chinese silver.

In order to repair the losses which I had suffered, I returned across Aksu and Ush-Turfan to Kashgar, and while I was waiting for the new outfit, I undertook, during the summer and autumn of 1895, a new journey to the Pamir plateau and Hindu Kush, and had a pleasant stay with the officers on the Anglo-Russian boundary commission. I never shall forget the hospitable manner in which General Gerard, Colonel Holdich, and others received me.

On December 14, 1895, I left Kashgar for the last time. In twenty-three days we marched across Ordum Padsakah, Yarkand, Kargalik, and Guma to Khotan—the same way taken by Marco Polo six hundred

years ago. Between the last-mentioned towns, we passed a couple of spurs of the desert where the road is swept away by every storm. Poles have therefore been placed along the road to mark the way. It is the same custom referred to by Marco Polo, when he says that travellers erected a pole every night, in order that they might know the next morning which way they were to go.

On January 14 I again broke up camp, and left Khotan with the smallest caravan I have ever had—four men and three camels. We were to cross the great desert in its broadest place. We had gone through sad experiences, and knew full well the many dangers to be run, and we therefore made our outfit as light as possible, for fear that we should again be compelled to leave everything in the desert sands. The larger portion of our baggage was left in Khotan, to which place we must consequently return. We took provisions with us for only fifty days, but were four and a half months on the way. The worst of it was that I did not take my Chinese passport with me, and therefore got into trouble with a couple of mandarins. Such things as tent and bed were reckoned among luxuries. During this whole journey, I slept, like the men, on the ground, wrapped in furs. The temperature fell to $-7\frac{1}{2}^{\circ}$ Fahr., but we almost always had fuel, and the spring was approaching. From Tavek-kel we directed our course for some days eastward, taking with us a couple of gold-hunters, who, for a high remuneration, promised to show me the way to an old city. On January 24, when the dunes rose to a height of 45 feet, we reached the place. In the valleys between the dunes, we could see, as far as the eye could reach, ruins of houses built of poplar. As a rule, the timbers of which the framework had been built were only standing about 2 feet high. They were very much worn by drift-sand, chalk-white, hard, but so brittle that they broke like glass when struck. The walls consisted of interwoven reeds covered with plaster, on which we found some artistic mural paintings—praying women of the Arian type, Buddha sitting on the cup of the lotus, tasteful ornaments, etc. An excavation led to the discovery of a manuscript and some plaster casts. There is no doubt that this city is of Buddhist origin, and we may thus *à priori* with perfect certainty assert that it is older than the Arabic invasion led by Kuteybe-ibn-Muslim in the beginning of the eighth century. Comparative researches in regard to Buddhist art in India, in connection with the calculations I have made as to the travelling speed of the dunes, will doubtless lead to a more definite determination of the age of the city. On January 26 we reached the Keriadaria forest-belt, and camped beside the thickly-frozen river. On our continued march to the north, we made several important discoveries. It had been believed that the river soon ended in the desert, but I found that it extended as far as $39\frac{1}{2}^{\circ}$ N. lat. At Tonkusbaste it divides into two beds, which periodically alternate with each

other. In its forests there lives an almost entirely isolated tribe of nomads, of whose existence not even the Chinese have the least idea. West of Tonkus-baste, in the sands, there are the ruins of another ancient city, showing the same peculiarities as the one above described. The timber foundation of one of the houses was very well preserved. Now, since the two cities lie on a line parallel with the present course of Keria-daria, I suppose that the river has moved to the east since the flourishing time of these cities, the same as is the case with Yarkand-



IN THE TAKLA MAKAN DESERT.

daria and Khotan-daria, for whose moving eastward I have found several proofs. In the region where Keria-daria dwindles down to a little brook winding between the dunes, and finally disappears in the drift-sands, the wild camel lives in great herds in undisturbed peace and quiet. We shot three. The meat was by no means bad, and the fat in the humps was a splendid shortening for our rice-puddings. They live in the desert on sporadical tamarisks, and very seldom come to the river to drink. The herdsmen at lower Keria-daria asserted that the camels do not drink at all in the winter, and that nothing will frighten

them so much, as the smoke from the camp fires. If they smelt burnt wood they would run off like the wind, and not stop for two or three days. This may be a characteristic due to atavism. I might prove this by details, but I have not time this evening.

For eight days more we had sterile desert before we saw any signs of the river Tarim, and when we marched into Shah-yar, we had crossed the Takla-makan desert in forty-one days—a journey which I would not have undone, but which I hope to be able to do again, for this desert-ocean conceals the traces of an ancient and high civilization, and the saga-like legends are not to be despised. In the primeval forests of Tarim, I classified the complicated river-system, and on March 10 we reached Korla, from which place I made an excursion to the Mongolian city Kara-shar, which led to important discoveries in regard to the relation of Bagrash-kul to Kontje-daria.

Prjevalsky was the first European who travelled to Lob-nor, and when he found this lake a whole degree further south than the Chinese maps place it, and, besides, declared the water to be fresh, a difference of opinion arose between him and Baron von Richthofen, which, ever since the death of Prjevalsky in 1888, has been waiting for a final decision. Richthofen showed in a clever manner that a desert lake which has no outlet to the sea must necessarily contain salt water, but since the basin of water found by Prjevalsky was fresh, and since the Chinese topographers, who are not used to putting things on their maps which do not exist, had placed Lob-nor a whole degree north of the lake discovered by Prjevalsky, Richthofen maintained that this body of water must be of modern formation not existing when the Chinese topographers mapped the old Lob-nor. Prjevalsky went by the main route between Tarim and Konchek-daria, and later travellers have followed in his footsteps. If I were to be able to contribute to the solving of the problem, I must necessarily go through the desert east of the last-named river, from which an arm should branch off to an eventual lake in the east.

On March 31 I left Chikenlik. We found that Konchek-daria divides, so that a part of its water goes to Chivilik-kol; but the larger portion, under the name of Dek, runs south-east, and my satisfaction was great when, on April 4, after following the left bank of the river for three days, I found that, just as the Chinese and Richthofen claimed, it empties in a long lake, whose eastern shore-line we followed for three days. The people living in the neighbourhood of Lob-nor call its four basins Avullu-kul, Kara-kul, Tayek-kul, and Arka-kul, but the Chinese call the whole region Lob-nor, a name which, in the tract around the south lake, is absolutely unknown. I found the lake to run north to south, while the Chinese Lob-nor is mapped as running east to west. But even this circumstance has a natural explanation. Since the whole Lob-nor district lies nearly in the same horizontal plane, the hydrographical

distribution must be extremely sensitive to any change in level. There are two constant factors effecting such changes, namely, the easterly sandstorms, which are especially violent in the spring, filling the basin and pressing the lake westward, and the sediment carried down by the river. That the lake formerly really extended eastward is shown by the fact that the eastern shore is skirted by a series of already isolated salty pools and marshes, as well as deep bays which will soon be isolated, and by a narrow belt of forest in which three separate growths may be distinguished—in the east, dried-up dead forest; in the centre, fresh forest with tall trees; and nearest to the present shore, young forest. Thus we see that the forest travels with the lake westward. The superfluous water continues through Sadak-kul and Nias-kul to the river Tarim. There are still other proofs that the southern lake must be of modern formation. It lacks every trace of forest, while the whole Tarim system, all the way down to the ancient Lob-nor, is very rich in poplar. The forest has not yet had time to extend to the new lake. Furthermore, the eighty-year-old Lob chief, Kunohikan-bek, told me that his grandfather, Numet-bek, had lived in his youth on the shores of a lake in the north, and that then there was only deserts to be found in the region of Abdal. Finally, I might mention that Marco Polo, who travelled through the city Lob, does not say a word about any lake.

Our journey along the shores of the ancient Lob-nor was rather troublesome, for the infringing sand here lies high and soft, and the temperature at noon rose, as early as April 6, to 91° Fahr. in the shade. Our greatest torment was the gnats, which on calm days formed perfect pillars of cloud. One evening, while camping on the shore, we were so violently attacked by them that we had to resort to a rather unusual weapon—setting fire to the dry last year's reeds, which formed a dense thicket covering a larger portion of Kara-kul, and the fire spread like a prairie conflagration, spreading a lurid glare over the whole lake. A sea of fire is, at all events, something unique.

From Kum-tyeke, in whose neighbourhood we visited the ruins of an old Chinese fortress, Merdek-shahr, I sent the caravan in advance to Abdal, while, with two Lob-men, I took a very enjoyable journey by boat on lower Ilek, Tarim, and southern Lob-nor. The Lob-dwellers spend half of their life in their long narrow canoes, which are dug out of poplar trunks, and rowed by broad oars held vertically. Noiseless and swift as fishes, the light canoes glide over the dark blue bosom of the lake, with its reed-hidden shores and its playfully curling eddies. On Sadak-kul we were overtaken by a violent easterly storm; the waves foamed and hissed, and we came near capsizing before we reached the protecting narrower water-ways.

On the farthest Lob-nor, the reeds grow very thick. They are frequently 2½ inches in circumference, and reach a height of 27 feet.

The greatest depth of water which I sounded was 15 feet. The reeds are intersected in all directions by "chappgans," or passages about a foot wide, which are kept open by the Lob-dwellers for fishing-nets. These passages are made by pulling up the new shoots from the bottom every spring. When we enter such a passage it becomes dark and close, and it seems as if we were disappearing in a tunnel of reeds. We lived here on wild ducks and geese and their eggs, as well as on fish, and lived an idyllic life. My stay on Lob-nor is one of my most pleasant recollections from my journey through Asia.

From Chargalik we set out with our caravan of horses on our journey of 600 miles to Khotan, partly the same way taken by Marco Polo, and which took us through Cherchen, the gold districts of Kopa and Surgak, Nia and Keria. In Khotan, which place I reached on May 28, the obliging *amban* of this city, Liu-darin, gave me back a large portion of the things which I had lost when shipwrecked in the desert. Herdsmen and hunters from Khotan-daria had found them by following the tracks of foxes who had scented our provision-chests during the winter; but I did not find much joy in getting back my fine photographic apparatus, for the natives had taken all the negatives and put them to use as window-panes.

In Khotan we prepared for a hard campaign in North Tibet, marched back to Kopa, and from there to Dalai-kurgan, near the north foot of the Kuen-lun mountain, the last place where we found human beings. They were Tagliks, and Jaggatai-Turks, and live a half-nomad, half-domiciled life, subsisting mostly on sheep-breeding, but sometimes raising barley. They live in dens in the ground, dug in the yellow, loose layers of loess, which form a transition from the mountains to the desert.

On August 6 we left Dalai-kurgan, and marched through the secondary pass Sarik-kol to the upper course of the Mitt river, where the country is called Lama-chimin. The names Dalai and Lama, as well as Kalmak-chapp and Kalmak-uturgan, and others, remind us that Mongolians have once lived here.

(To be continued.)

EXPLORATIONS IN THE INTERIOR OF WESTERN AUSTRALIA.*

By the Hon. DAVID W. CARNEGIE.

THE Expedition consisted, besides myself, of Joseph A. Breaden as second in command, Godfrey F. Massie, Charles W. Stansmore, and Warri (an aboriginal boy from the McDonnell ranges, South Australia); nine

* Paper read at the Royal Geographical Society, February 14, 1898. Map, p. 332.

FOUR YEARS' TRAVEL IN CENTRAL ASIA.*

By Dr. SVEN HEDIN.

The caravan with which I crossed the plateaux of Northern Tibet consisted of twenty-one horses, six camels, and twenty-nine asses, and when I say that forty-nine of these animals, or ninety per cent., died on the way, some idea can be formed of what we had to go through. When we reached the country where pasture was scarce or was entirely lacking, one or two of our animals died every day, and their mummified bodies, which in this high, cold atmosphere do not decay, but simply dry and shrivel up, still lie there like milestones, to mark the way we passed. We had twelve sheep as travelling provisions, and three watch-dogs, one of whom, Yolldash, who would not let any one approach my tent except my body-servant, Islam, is now boarding in the most desirable comfort with the Conseiller d'Etat, Mr. Backlund, at Pulkova, where he impatiently awaits my next journey through Asia.

On this expedition I had eight permanently engaged servants, with Islam-bay at their head. Among the others I should mention Fong-shi, a young Chinese who spoke Turki, and who was going to be my interpreter in China; Parpi-bay, a Sart who had been with Carey and Dalgleish, Bonvalot and Prince Henry of Orleans, Dutreuil de Rhins (whose murder he had witnessed), and for a time had partaken in Pevtsoff's expedition; and Hamdan-bay, from Cherchen, who had accompanied Littledale on his journey across Arka-tagh. Furthermore, I had engaged for two weeks fifteen Tagliks, two of whom deserted in the very beginning of the journey. We took with us three months' provisions for ourselves, and maize enough to last the animals for one month. I had a tent all to myself, and only Yolldash was allowed to sleep by my side, but the Tagliks slept under felt carpets spread over the maize-bags, which were piled up in form of a circular wall every time we camped. It really did not matter so much that the animals died off the one after the other, for the provisions ran low in proportion; but it was distressing to see their sufferings.

On the plateau we took the following order of march. I gave orders every evening in regard to the direction in which we were to march the next day, and early in the morning the camel-caravan set out; shortly after, the asses, with the provisions for the animals; and two hours later the horse-caravan started off, soon overtaking the others, and selecting a suitable place for the night's encampment, which must be near water and pasture. Accompanied by one man only, I came last, since I was always strictly occupied with mapping, geological surveys, etc. We had some difficulty in getting across the northern border-

* Read at the Royal Geographical Society, November 22, 1897. Continued from p. 258. Map, p. 332.

mountains of the Kuen-lun chain. I had examined the Chargalik pass, but found it impossible for the camels to traverse; but we managed to cross Jappkalik (about 16,000 feet) without unloading the animals.

We then followed one of the tributaries of Kara-muran up to its sources, where the landscape already is a transition to plateau-land. Here, in one place, a picturesque group of mountains rises from the rolling country, resembling an aggregation of truncated cones with grooved sides. They proved to be horizontal beds of tufa, protecting



WATER IN SIGHT.

substratified sandstone and very hard conglomerate from weathering. The tufa is jet-black, while the rest is brick-red; and these peculiar mountains, which were hereafter by no means scarce, could be seen like beacons at a great distance. Between Arka-tagh and a little mountain range north of this mountain, we marched east-south-east, all the time looking for an easy pass. We did not succeed in this, however, before we reached the place where Littledale had found a pass, which Hamdan-bay had undertaken to show us. He could not find it, however, so we crossed Arka-tagh by a new pass (17,000 feet high), a few miles east of Littledale's pass.

The thin air had many injurious effects upon my men. During the first weeks every one was sick, and complained of headache. Already, on reaching our fourth halting-place after leaving Lama-chimin, Fong-shi was half dead, and had to be sent home to Khotan with two Tagliks. This was a fine prospect indeed; what should I do in China without an interpreter? At the fifth halting-place, Islam-bay was so ill that we had to stop three days. He thought he was going to die, and told me to go on without him, but he fortunately got better. At the eighth encampment I turned off three Tagliks, and the others, who were to go on with us, asked to be paid half of their salary in advance, and I



THE ISFAIRAN VALLEY NEAR AUSTAN.

granted their request. I was, however, rather surprised the next morning to find that all the Tagliks had deserted, and taken a dozen asses, two horses, and provisions. I did not submit to this, however. Armed with rifles and revolvers, Parpi-bay and two other men mounted our best horses and followed the deserters until they caught up with them. They were forced to go back to the camp, where the ringleader was punished, and the others were compelled to give back the money which had been paid them in advance. After this they were kept bound at night until we were sure of them. I have not time now to describe the interesting geological section which I had the opportunity of making of the parallel mountain ranges of Kuen-lun; granite, syenite, diorite, and crystalline schist are predominating. From the Arka-tagh pass we saw, far to the south, a great chain of mountains with

perpetual snow-fields and shining tops. This range is parallel to Arka-tagh, and constitutes, as I afterwards found, a continuation of Koko-shili. Its highest peak was called King Oscar's mountain, after my generous monarch and protector. Between these two gigantic chains, which run from east to west, stretches a rolling plateau, which is divided into a whole series of basins without outlet. Every such basin is bounded on the north by Arka-tagh, on the south by the parallel chain, on the east and west by small, insignificant, water-shedding passes, separating the one basin from the other. In the middle of each basin there is a lake with clear but bitter water, which the streams from the surrounding mountains collect. In travelling east we discovered twenty-three such lakes, of whose existence not even the Chinese had any idea. The largest was three days long. All this part of the country was carefully mapped, and all the mountain-tops were put down on the map.

The landscape is very desolate, and when the average height reaches 16,000 feet, it is clear that vegetation must be scanty. I collected all the plants we found. They had, as a rule, rather fleshy and downy leaves, lying close to the ground in order to protect themselves from the wind and frost. The poor pasturage which was now and then found was so scattered and bitter, that the animals would not have eaten it if they had not been driven to it by hunger. The ground is, however, generally perfectly bare, and the weathering-products, which have washed down into the central parts of the basins without outlet, have, in the course of time, been disintegrated into very fine particles, so that sand and gravel are very scarce. Since the ground is damp, as a result of dew and rain, it becomes soft, and the animals frequently sank a foot deep, which fatigued them all the more. Only the lake-shores, along which we frequently travelled, were suitable for our march. The cold was not at all great, and in the daytime one could even ride without a cloak, on account of the strong insolation. At night the temperature seldom sank under 14° Fahr. The worst of all was the wind and hail. With the regularity of clockwork, the west wind came every day at one o'clock at noon, and swooped down upon the plateau with intense fury. The mornings were generally fine, but in the afternoon the horizon became black, a rushing, hissing sound was heard in the distance, the noise came nearer and nearer, the whole country round was enveloped in a dark fog, and we were frequently obliged to stop because we could not see where we were going. During these storms, the lakes offered a grand spectacle. High, white-crested waves, green as emerald, beat with a metallic ring against the shore. The mountains on the other side of the lake could not be seen through the fog, and one could imagine that one stood on the shore of the great ocean, to which one always has an indescribable longing when in the centre of a great continent far from the sea. These lakes were otherwise

dead and desolate; never before had their shores been trodden by human beings; and the country where they lay was just as desolate as the lakes themselves. Once or twice we saw wagtails and larks, and geese on their way to their winter quarters in India. A species of gull, of which I have brought home a specimen, was, however, very common. These gulls seemed to enjoy hail and snowstorms, for when such a storm was raging they would cover the surface of the lake by the hundred, peacefully rooking on the waves.

The only animals that were capable of putting any life into these wild, desolate regions were the yaks and khulans, and there are incredible numbers of them here. The yak-dung afforded us the very



THE CARAVAN IN THE ISFAIRAN VALLEY.

best of fuel, and every evening we could warm ourselves by fine, large camp fires. The sheep which we had taken with us soon proved to be insufficient, and when the last one had ended his days with his head turned towards Mecca, we had to shoot yaks in order to get fresh meat. Islam excelled in this sport. He provided all the men with meat, and I got the tongue, which was the tit-bit. I have brought home the skin of a magnificent specimen, a bull 11 feet long; but he was hard to shoot, that beast. He had to be given seven bullets before he would bite the dust, and the next day, when we were going to skin him, he had disappeared. We soon found him, however, not far off, walking along slowly with his nose to the ground, and there was still enough life in him for him to chase us; but after receiving four more

balls, he died in earnest. He had no less than eleven Berdan bullets in his body before he would give up the ghost. It is impossible to kill the yak instantly unless the bullet pierces his heart. If he is hit in the pelvic region, he will go about three or four days before he will die; if he gets a ball in the forehead, he will only sniff a little and shake his head; but if the ball hits him in the back or in any other place where it hurts him, he will puff and snort like a high-pressure saw-mill engine, the dust flies about his nose, he throws his tail into the air, and rushes on to the man who shot him. Thus it is a dangerous hunt. The largest herd of yaks which we saw numbered about eighty, but they are usually found in numbers of from three to eight, and sometimes solitary. The khulans are generally seen wandering about in small herds, but in the frontier mountains of Tsaidam we saw herds numbering 150. The khulan is a stately animal, a higher animal in both meanings of the word; his beautiful brown and white colouring, his noble form and powerful sinewy muscles, his high-carried head, and his broad chest well fitted for powerful lungs, give him a very attractive appearance when, as swift as the wind, he darts off with light elastic bounds across the hills of the wilderness. They contemplated our caravan with dull surprise as we slowly wended our way with failing strength towards the east, accompanied by the doleful twang of the camel-bells keeping funeral time, and, in reality, each of our hungry horses looked like the Rossinante of Don Quixote in comparison with the knightly, free khulans, who had been born and brought up in this thin air, and were accustomed to the meagre pasturage. The cry of the khulan, his long ears, his tail, with its terminal tuft of hair, make them much more resemble the ass than the horse. I have brought home a hide. The flesh is unedible, and has a very disagreeable flavour; but the flesh of the yak can be used for food, though it is as tough as gutta-percha, and must be cooked for a day or two in order to get it anywhere near tender, which may depend somewhat upon the rarefaction of the air, since water boils at about 180° Fahr.

Thus we wandered day after day across the plateaux of Tibet for two months without seeing a single living being. We found traces of man only twice during this time: at the last halting-place north of Arka-tagh, where a charred pile of coals after a camp fire showed that we were crossing Littledale's route; and between our seventeenth and eighteenth halting-places, where, in the soft sand, we still found traces of Bonvalot's and Prince of Orleans' camels, these tracks having remained undisturbed for eight years. Meanwhile our caravan dwindled down in an alarming manner; at last the men had to go afoot, and we thought that it was time to try to find inhabited country.

North-east of the last great lake, Arka-tagh showed a great incision in its summit, and by two rather comfortable passes we reached the sources of a river, which was afterwards found to be a tributary of

Napchitai-muren. On September 30 we saw the first traces of Mongolians. On the west bank of the river there was a fine *obo*, or stone cairn, raised in honour of the gods of the mountains. It consisted of forty-nine black slabs of slate, as thin and smooth as school-slates, and so placed that they resembled a stable with three stalls. They were covered on both sides with beautifully chiselled Tibetan writing-signs. Since the great pilgrimage route of the Mongolian pilgrims to Lhasa crosses just here the frontier mountains of Tsaidam, I thought that this stone book contained important historical documents, but soon found that the same writing-signs re-occurred in a defined order all the way. It was the



THE CARAVAN ON THE SUMMIT OF THE TENGIS-BAI PASS.

Tibetan creed: "On mane padme hum," which was engraved four thousand times in the stone, and it was our first acquaintance with the religious excesses of Lamaism.

When, on October 1, we went further down through the valley, we saw some grazing yaks on a spur of rock. Islam-bay stole carefully into range. After two shots had missed, an old woman came running towards us, shouting and gesticulating, and we then understood that they were tame yaks, and that we had now reached the first human dwellings after two months of solitude. The old woman took us to a tent made of nothing but rags, and surrounded by heaps of "argal" and great pieces of yaks' flesh. An eight-year-old boy was her only companion. Our conversation with this old woman was a test of eloquence. She, of course, did not know whether we were "birds or

fishes," and none of us understood any Mongolian. I knew the three words usual on the maps: *ula*, which means "mountain;" *gol*, "river;" and *nor*, "lake;" but to get the old woman to understand, by the help of this vocabulary, that we wanted, first of all, to buy a sheep, was no easy matter. So I began to bleat like a ram, and showed her a Chinese two-liang piece, and she understood me. Thus we had fresh mutton for supper this evening. Her husband, Dorchey, came back in the evening from the mountains, where he had been hunting yaks. They stay here all winter, and supply their tribe in Tsaidam with yak-meat. Dorchey was not a little surprised at seeing us, but he was a clever fellow, and became my first teacher in the Mongolian language. He was afterwards our guide across Yeekey-Tsagan-davan, in the Tsagan-ula mountains, down to Tsagan-gol in Tsaidam. Every evening I took a long lesson in Mongolian, and when we had been together a fortnight I could speak the language tolerably well, and never afterwards needed any interpreter. At Tsagan-gol I discharged several servants, and bought twenty horses.

Between Astun-tagh and the southern Koko-nor chain in the north and the Kuen-lun parallel chains in the south, extends the great basin called Tsaidam, which in physical geography has the same importance as the Tarim basin, although it is smaller, more rolling, and situated about 5000 feet higher. In its central portions there are several salt lakes, of which Dabasun-nor is the largest, and into it flow the rivers from the frontier mountains.

Around the lakes there extend great wildernesses, salt deserts, and marshes, perfectly uninhabited and sometimes impossible to cross; but along the foot of the mountains there are vegetation and pasturage, where the Tsaidam Mongolians tend their flocks of sheep and goats and herds of horses. They frequent the mouths of the valleys, where the rivers discharge, or around wells. I will give a description of the customs and life of these people in the narrative of my journey, which is to be published next autumn. They received me everywhere with hospitality. We went along the foot of the southern frontier mountains, across Bhaganamaga, Hodyegor, Tsacha, Yeekey-gol, Urdu-toley, and Hattar, whence we crossed the salt desert, passing Ova-togoruk, the river Chara-ussu, and Tsaka-Tsak. All these are names of pasturages or wells, for towns and villages are entirely lacking in Tsaidam. The Mongolians live in the same kind of *yurts* as the Kirghiz.

Thus we followed the western shore of Toso-nor, where there are extensive steppes, and continued along the southern shore of Kurlyk-nor. The latter lake contains fresh water, for Baian-gol, which empties into its north-western part, passes through this lake, and continues under the name of Haluin-gol to Toso-nor, which has no outlet, and therefore is salt. At Hlakimto there is a stately *obo*, or cairn, raised in honour of the gods of the sea.

We had camped for the night on the shores of the lake Chara-nor, in whose vicinity bears are so common that the camp and the horses had to be protected by fires; and on the following day, November 1, we started for the well district, Chara-sharuin-kub. We followed a narrow path through the broad valley. Here my Mongolian guide, Loppsen, and Islam-bay discovered a fresh bear-track, and followed it. After about an hour had passed, they came back in the wildest gallop, holding their guns above their heads and crying, "Tangutian robbers;" and, sure enough, at their very heels charged a troop of twelve mounted Tangutians, all armed with long black rifles, and enveloped in a cloud of dust. It was only a moment's work to dismount, get the baggage-



RANG KUL.

horses in a protected position behind some bushes, and level our rifles ready for action. When the Tangutians found that we were quite a number, and saw our rifles gleaming in the sun, they made a sudden halt and held a council of war, after which they separated. Half of the body went up towards the mountains, and the other half rode parallel to us about two gun-shots distant, when we quietly continued our march. We had, however, a narrow rocky passage to go through, and Loppsen was afraid that the Tangutians would lie in ambush here and open fire on us. We came happily through this passage, however, and out into open country, where we encamped beside a well. At night the horses were tethered, and sentries were put on guard, with orders to beat on kettles, in order to let us, as well as the robbers, know that they were awake.

As soon as it became dark, they made themselves heard in all directions around our camp, giving wild yelps and screams like hyenas or wolves. Loppsen said this was to find out if we had dogs, and they succeeded, for our dogs barked and howled furiously until daybreak. Thus their planned attack was frustrated. The next day they followed us for some distance, but finally gave it up as a bad job. We were, however, on our guard after this. Dutreuil de Rhins had been attacked and killed in this neighbourhood, and Prjevalsky had a battle with three hundred robbers; but he had two officers, twenty-one cossacks, and a gatling-gun. I was alone with only a few natives and three rifles.

Such was our entry into the land of the Chara-Tangutians. The Mongolian name *chara*, or "black," is here synonymous to the word *mo*, meaning "bad," because the Tangutians have a bad reputation as robbers and thieves. They speak Tibetan, have the same faith as the Mongolians; they carry around the neck the same *gavos*, or case, containing *burghans*, or idols, and make the same pilgrimages to Lhasa. The present Dalai Lama is a Tangutian boy. They live in great black tents of coarse cloth, raise sheep, goats, and yaks for a living, have horses and camels, get their cereals and household utensils from Ten-kar and Si-ning, are very sure shots, and frequently plunder their Mongolian neighbours. When the Mongolians go to Si-ning or to the temple feasts in Kumbum, they always travel in large well-armed bands. The Tangutians are always armed to the teeth. At Dulan-kit we found a great Tangutian camp, and stayed there a couple of days. Here I went about among the tents with Loppsen as interpreter, making sketches and notes. They did not seem to pay any attention to us when we came in, only casting distrustful glances at us, but they were soon taken aback by my easy and cool manner.

Crossing the southern Koko-nor mountain-chain by the pass Nokaoten-kotal and the river Buhain-gol, which I forded higher up than Abbé Huc, we at last reached Koko-nor, from which lake it was still 1000 miles to Peking.

The blue lake, or the Koko-nor of the Mongolians, the Tso-ngombo of the Tibetans, and the Tsing-hay of the Chinese, is situated at an absolute height of 9975 feet, and has clear blue salt water, which gives rise to its name. The lake is frozen over three months in the year; but every violent storm causes great cracks and openings in the ice, so that pilgrims cannot ride across it to the temple on the island in the middle of the lake. They therefore make sledges, on which they take provisions and fuel for three days. They are, however, frequently hindered from reaching the island by great gaps in the ice, or they are detained on the island by thawing weather. The water-level varies much in different years. Low water prophesies a good year; but when there is high water, the herds are decimated by the wolves,

the Tangutians die off in disease, and the pasturage is bad and soon dries up. In the summer the water is higher than in the winter. These irregularities have perhaps contributed to lead "Pater Huc" to think that there is an ebb and flood in Koko-nor.

Nine months before my visit, the Dungan rebels, fleeing before their Chinese pursuers, devastated the country and stole 400 sheep and 140 horses and yaks at Yeekey-ulan, but the water had been unusually high, which of course accounts for it. In several places in the Buhain-gol valley we had seen traces of the Dungan camp fires. Wherever they had gone they had devastated the country like grasshoppers.

A day's journey from the city Donkyr, where I found three of Captain



THE CARAVAN IN THE ALAI VALLEY.

Wellby's servants, lies the renowned temple Kumbum, where we arrived on November 20. It is a whole village of temples, built in motley but tasteful and elegant Tibetan style; but the main temple, Sirkang, is its nucleus, for under its roof of thick gold plates sits the god Sardinchi-ye Tsung-kaba, fully 30 feet high, overlaid with gold, and dressed in precious silk mantles, and before this god the pilgrims throw themselves on their faces. A deep and mystical twilight reigns in this temple, but before Tsung-kaba there are five lamps burning on the floor, and in front of them stand five *jolas*, or richly ornamented vessels, containing diverse edible offerings to the god, such as tsamba, butter, cereals, water; and beside these vessels there are also lamps burning, which increase the almost Catholic mystical light effects. The temple is a perfect museum, full of other gods and innumerable volumes of holy Tibetan books. The high *lama* of the temple was condescending enough

to let me see everything, on my promising not to make any sketches. The way in which I kept this promise is shown by the magic-lantern slides.

Tsuggtjin-dugun is a temple whose outer balconies support a large number of *korles*, or prayer-mills, which are vertical cylinders which may be turned on their axles by means of cranks. They are filled with strips of paper covered with the sentence, "On mane padme hum," and the duty of certain *lamas* is to turn these cylinders and send the prayers to the knees of the gods. There are said to be about three hundred *lamas* in the temple. Bareheaded, barefooted, and beardless, clad in long red pieces of cloth, these simple-minded *lamas* idly wander about in the temples, in the colonnades and courtyards, and are ridiculous in the slavish devotions they pay to the images that they have themselves made. I also saw the tree on whose leaves, according to Abbé Huc, the prayer "On mane padme hum" spontaneously grew every year, and whose leaves are sold at a high price to the credulous pilgrims. Loppen whispered in my ear, however, that the *lamas* painted the letters on the leaves during the night.

On November 23 we reached the strongly fortified city Si-ning-fu, whose western gate was decorated with a large number of human heads enclosed in wooden cages and labelled. I was told that they were the heads of chiefs who had partaken in the last Dungan rebellion. Dungans are Mohammedan Chinese, and when the Chinese mandarins interfered in a religious quarrel in the Salar district, rebellion broke out in December, 1894. The revolt took on large proportions, and in July, 1895, reached Si-ning, and the country people round about the city took all their movable property inside the walls for safety, so that the population increased from 20,000 to 50,000. Soon battles were fought near the city, and wounded Chinese were brought to the city, the temples of the gods were transformed into hospitals, and Mr. and Mrs. Ridley, two English missionaries who showed me the greatest kindness, had their hands full to tend the wounded. On September 1 the town, Tung-kwan, just outside the east gate of Si-ning, rebelled, and all the Chinese in the town were killed. Si-ning was beleaguered for five months, and famine and pestilences began to rage. People began to venture outside the city, in order to get fuel and food, but the Dungans always lay in ambush, and killed all who showed themselves.

The civil ruler of the city, the cowardly Dao-tai, was on good reasons suspected to be guilty of treason. After the war was ended, he was called before the emperor to receive the fine silk cord which means "Go home and hang yourself." He did not go, however, but killed himself with opium at Lan-chau. It was expected every day that the city would capitulate, and the Chinese gave their wives large doses of opium for them to swallow the very moment the city should

be taken, in order that they might not fall victims to the Dungans. But thanks be to its strong walls and excellent Djen-tai, or super-general, Si-ning held out, and in January, 1896, received succour from General Ho, who came up from the Japanese war with two thousand men. It is impossible to form any conception of the cruelties committed on both sides—small children were transfixed on lances, and the prisoners were martyred in the most outrageous manner. When the Dungan village To-ba, which has a strongly fortified position between Ten-kar and Si-ning, had held out for several months, it was obliged to surrender, but did so on the conditions that its inhabitants should be allowed to leave the town unmolested. The Chinese accepted this proposal, but required the inhabitants of the town to stack their weapons. This was hardly done before the Dungans were attacked and killed to the last man.

The populace howled like wild animals when General Ho's soldiers came back from their campaign with Mohammedan prisoners, who were triumphantly led in chains through the streets of Si-ning to Djen-tai-jamen to receive judgment, which was soon forthcoming. They were led out again, and outside the gate their throats were cut with dull knives. Then the chest of each was opened, and the heart and liver were stuck on spear-points, and thus carrying these trophies to the nearest eating-house, the soldiers had them fried and then ate them up. The Chinese believe that if they eat up the hearts and livers of their enemies, their courage will be transferred to themselves. It is said that 50,000 Chinese and as many Dungans were killed during this rebellion. Mohammedans are brave soldiers, but in this case they had bad weapons. The Chinese are incredibly cowardly. For instance, a large force of them beleaguered a Mohammedan town near Si-ning, and shot at its walls for three days, but did not dare make an attack, fearing that the inhabitants were prepared to play a ruse on them, since there were no sentinels posted on the walls. General Ho came to the scene, and had the gate blasted open. An old blind woman, the only remaining being in the town, came up and said that all the rest had fled to the mountains long ago, and she had been wondering why the Chinese had been making such a noise with their cannon outside the walls.

It was really a sad journey we had through this part of the country. For whole days we marched through devastated fields and past ruined villages and burned cities. In Tung-kwan, the streets were lined with blind old people, for when the Chinese had taken the village, they let the old people live, but blinded them.

From Si-ning, I sent home my servants from Eastern Turkestan. Only Islam-bay accompanied me now, besides the Chinese servants, and my luggage was carried on mules to Ping-fan, from which place I continued with carts to Liang-chau, where I spent the Christmas

holidays with very friendly English missionaries. A telegraph-line connects Liang-chau with Shanghai, and I therefore telegraphed to his Majesty King Oscar, and had the honour of getting an encouraging telegraphic reply from his Majesty just in time for a Christmas present. This was my first greeting in the far East from my native country.

The Chinese have their own ideas of the telegraph. They believe that the despatch is written on a piece of paper, which is rolled up and sent through the wire, and that the insulators are small halting-stations where the piece of paper can rest in case it rains.

From Liang-chau, I set off in the beginning of the new year with hired camels through the Ala-shan deserts, across Fu-ma-fu—whose *wang*, or Mongolian prince, received me politely—to Ning-sha, where Swedish missionaries have a little congregation of thirty Christian Chinese.

Our January travel through the Ordos deserts was hard. Hwang-ho, the Yellow river, lay covered with ice, and the temperature sank as low as -27° Fahr. Every day we had north-west storms, and I should have frozen if I had not had a *sholoo*, or Chinese hand-oven, up there on the back of the camel. We encamped by a well at the same time as a Dungan caravan, and in the morning it was found that one of the Dungans had frozen to death. The others asked Islam-bay to say a Mohammedan prayer over the corpse, which was laid between two stones, after which the others continued their journey as if nothing had happened.

After once more crossing Hwang-ho, it was nice to rest a few days at Bau-tu, in the home of countrymen, a Swedish missionary, by the name of Helleberg, and his wife. Mr. Helleberg had converted many Chinese, and had a school for thirty little Chinese boys, who, among other things, learned English. I went to hear a lesson in geography, and was greeted, on entering the room, with a "Good morning, sir; how do you do?" by all thirty boys in concert.

But now my patience was almost finished, and I longed for my post, which was waiting for me in Peking. After having left my caravan in good hands, and with a Chinese hurried *via* Salati, Kwei-wa-chung, Yo-ye-chung, and Kalgan—where for the fourth time I passed the great wall—to Peking, I was received with great amiability by the European ambassadors and by Li-hung-chang.

And here in the most eastern part of the middle kingdom ended my journey through Asia, from which I now have communicated a few scattered episodes.

Before the reading of the paper, the PRESIDENT said: We have from time to time heard of the work of a very accomplished young Swedish geographer in Central Asia, and on two or three occasions we have received communications from him,

but this is the first time we have had the great pleasure of welcoming him here in person. It is often said, "Poeta nascitur non fit," but it may equally well be said, and Dr. Hedin is an instance of it, "Geographicus nascitur et fit," for although geographers are often born so, it is also necessary to give them a long training. Dr. Hedin is a born geographer, and he showed this from the time that he was at school. At the age of fifteen or sixteen he made a series of maps of the arctic regions, showing the tracks of each arctic explorer, which displayed not only beauty in execution, but also very extraordinary research for a schoolboy. He made himself acquainted with all that was known of geography, studying in Sweden, in Halle, with our gold medalist Baron Richthofen in Berlin, and he became an excellent draughtsman. All the beautiful diagrams you will see on the walls were drawn by his own hand to illustrate this memorable expedition of which he is going to give us an account. He had made three previous journeys in Persia and Central Asia, so that we may naturally expect very great results from so thoroughly trained a geographer, and I must say that I have never seen work which has surpassed his in completeness and in thoroughness. Moreover, his love for geography is such that he was ready to face and overcome most desperate dangers and the greatest hardships in the pursuit of his objects, and he overcame them.

I think perhaps I ought to mention that, although Dr. Sven Hedin has addressed geographical audiences in the Swedish language, in the German language, in the Russian language, and in the French language, this is the first time he has ever addressed an English audience in the English language, and yet I think I may promise you that you will believe you are listening to an Englishman accustomed to address large audiences. It is quite certain you will hear a most interesting paper, and that it will be very beautifully illustrated both by diagrams and by photographs. I will now request Dr. Sven Hedin to address you.

After the reading of the paper, the following discussion took place:—

The PRESIDENT: In inviting a discussion on this very interesting paper, I can't refrain from expressing my sense of the very great loss we have sustained by the death of Mr. Ney Elias, only a fortnight after he was elected a member of this Council, on his return from twenty years' service in Asiatic countries. I looked upon him as being a great scholar as well as a great traveller, and as likely to become a successor of those illustrious men who used to make our discussions on Central Asian subjects so interesting. I am afraid that our Vice-President, Mr. Curzon, has disappeared in the darkness, but we are honoured by the presence of the Councillor of the Russian Embassy, M. Lessar, and I am sure the meeting will be very glad to hear his observations, if he should wish to make any.

M. LESSAR: La Société Royale de Géographie, fidèle à ses traditions, salue et encourage sans différence de nationalité tous ceux qui contribuent aux progrès de la tâche qu'elle poursuit. Bien plus encore, avec la largeur des vues d'une réunion de savants qui ont tant fait pour l'étude de notre planète, elle associe un étranger comme moi à la solennité d'aujourd'hui. J'apprécie doublement cet honneur; premièrement parce que ce n'est pas un simple voyage que nous fêtons, mais une exploration tout à fait exceptionnelle, et en second lieu à cause des liens de sincère et profonde amitié qui m'unissent au héros de ce soir. Le sort a appelé l'Angleterre et la Russie à l'accomplissement d'une grande œuvre civilisatrice en Asie. Cette coopération avec la Grande Bretagne dont nous sommes fiers, a eu, entre autres, de grands résultats pour la géographie. Mais le docteur Hedin n'ayant d'autre stimulant que la poursuite des problèmes purement scientifiques a néanmoins par ses travaux de quatre ans égalé les plus célèbres explorateurs contemporains de cette partie du monde. Ses lettres malheureusement mais inévitablement si rares lors

de son absence et surtout ce qu'il vient de nous communiquer tout à l'heure nous indiquent suffisamment quelles nouvelles lumières précieuses apportera le rapport détaillé de son voyage à nos connaissances actuelles.

Aussi je suis très reconnaissant à Mr. le Président de m'avoir invité à joindre aux souhaits de bienvenue qu'il vient d'adresser si éloquemment au Dr. Hedin mes félicitations et mes hommages d'admiration, et je crois pouvoir dire ceux de tous les géographes russes.

Sir HENRY HOWORTH: When Charles the King of Sweden was defeated at the battle of Pultawa, the heroic soldiers who had followed him from one victory to another were transported to Siberia. Among them were two famous men, one of whom was the first to give us a real picture of the geography, physiography, and ethnography of Central Asia. The book is anonymously written, but nothing like it has been written since. Now, one hundred and fifty years afterwards, we have another Swede who comes to rival, not this literary effort, but to rival the efforts of the greatest travellers of all time, following in the footsteps of Marco Polo, and the only European who has been able to follow in those steps.

What an interesting country this is! and I cannot help saying, and my friend will pardon me saying, how it would have delighted, "Pater et magister meus," Colonel Yule, one of the greatest of our scientific geographers, to have been here to-night. He had in his memory a most extraordinary store of knowledge of this district, and it seems to me, when the book is published which contains the record of these travels, we shall have added such a chapter as has never been added by one man before. The accounts of the cities buried in the sand, from which some of our English friends have discovered Buddhist manuscripts, and also brought home handfuls of coins, of which I have seen many, is full of extraordinary interest; it teaches us that along the northern slopes of that great tableland there was an Aryan population speaking a language allied to the Indian languages. Here we have for the first time some reason why these disappeared, and some reason why Marco Polo travelled this region in comparative ease, as well as many Chinese travellers two or three centuries before Marco Polo.

In these glaciers we have a kind of barometer, which shows us that the climate of the country has altered within comparatively recent times to effect this shrinking of the glaciers, this drying up of the sheets of water, which the Chinese geographers insist were to be found in the early centuries after Christ in a large part of this area, of which the great Lob-nor is merely a shrunken fragment; and here also we have a reason why so many of these old river tracks are found now to be full of dry sand. They are not merely winter torrents, but they are *bonâ fide* rivers which have shrunk into nothing. The cause is that the big lakes, etc., from which the rain could be gathered have shrunk into nothing. We have also another reason why the sandstorms overwhelmed the towns, from the fact that the rivers themselves have changed their beds, as it is the fashion for so many rivers to do on the other side of the mountains, and for exactly the same reason.

Two questions before I sit down. I am a great heretic on the subject of the wild camel, and I am bound to say Littledale and others have never quite convinced me. The opinion of some is that these wild camels are herds of semi-wild camels let loose for reasons of religion by the priests, and that they have become semi-wild, or feral, just like those wonderful camels in Australia, lost by the first great expedition, that traversed the continent from east to west and were actually found by one of my friends on the borders of Queensland. But there is another possible explanation. These rivers must have abandoned their old beds rapidly, if not

suddenly, or else the inhabitants would not have left their books and valuables. They must have left pretty rapidly, as the inhabitants near the Yellow river have to do, and in consequence large herds of camels must have strayed and become subferal.

Another question I would like to ask is, How do the birds which spend their spring and summer in Siberia find their way down to India, their winter quarters? Several men have traversed this region, and I have seen a good many of them, but they saw no live birds along the valleys at all, and it is a puzzle to know how they cross the plateaux and the Himalayas; but that they must pass over is shown by the fact that swarms of little soft-billed birds spend their summer and spring in Siberia, and in the winter are found on the other side of this tremendous plateau, with its almost impassable heights. The subject is so full of interest one might go on for ever.

I should like to thank Dr. Hedin very cordially indeed for the extraordinary pluck and endurance he showed, unbuffed by disaster, and for the delightful piece of racy and living English in which he has embalmed and enshrined his account of the journey.

Mr. DELMAR MORGAN: Let me, in the first place, pay my tribute of admiration to Dr. Sven Hedin for the admirable account he has given us of his journeys in Central Asia. Probably the most interesting of his explorations is his ascent of Mount Mustagh-ata to a greater height than has been hitherto attained by any European. But it is to his surveys and observations in the region of Lob-nor that I shall confine my remarks this evening.

About twenty years ago, the late Russian traveller, Prjevalsky, gold medallist of our Society, visited the region of Lake Lob, and placed this lake on his map, assigning for it a position about one degree too far south, according to Baron von Richthofen, who relied on the Chinese maps. The controversy which took place on this question between these two authorities was published in my 'Lob-nor.' Now Dr. Sven Hedin, a pupil of Richthofen, has discovered a lake confirming the views of this eminent geographer, and he claims that this and no other is the true Lob-nor. After studying the arguments adduced by him in support of this conclusion, I must, with every respect to one who has personally visited the region in question, be allowed to differ, and I think it would be premature to alter the position of the lake on our maps before more complete surveys have been made, especially as a recent traveller, M. Kozloff, a member of Pevtsou's expedition, passed through this country and made no change in the position of the lake, but, on the contrary, confirmed the general accuracy of Prjevalsky's observations. Among the arguments brought forward by Dr. Sven Hedin, he says that Marco Polo made no mention of the lake. But it is well known that Marco Polo mentioned very few of the natural features which he must have come across in his travels. Besides, the route he took would have taken him a considerable distance to the south of Lob-nor, and would have nearly coincided with that followed by Robarovsky and Kozloff in order to reach Shachau. These travellers speak of a vast extent of saline swamps, marking what must have formerly been the continuation in a north-easterly direction of the waterspread of Lob-nor. The ancient lake-bed is, according to their surveys, clearly defined by ranges of mountains to the north and south, meeting at some point to the north-east of Prjevalsky's lake.

I trust that Dr. Sven Hedin will excuse this criticism of only one point in his extremely interesting paper, and accept my congratulations on the very successful journey he has made—a journey full of privations and hardships, which he seems to have borne better than the natives who accompanied him.

Dr. SVEN HEDIN: I have to offer my hearty thanks, before all other things, to the President and to the Royal Geographical Society for the friendly and honourable manner in which I have been received here, and for the friendly remarks made during the discussion. I have to thank my old and dear friend M. Lessar for his congratulations on my journey. In the year 1890-91 he received me in Bokhara, and I spent some very agreeable and pleasant days in his house. I afterwards saw him in 1898 at Tashkent, and in St. Petersburg, and I am very happy to have had an opportunity to see him here again. That gives an argument to the saying that we live in a very small planet. Sir Henry Howorth uttered some very nice words to me. As to his opinion about the wild camel, I quite agree with him. I always had an impression that the wild camels I found to the north of the Keria-daria are the successors of tame camels, and when I write in my paper that the shepherds told me that the wild camels do not fear anything so much as the smoke from the camp fires, and that when they smell the smoke they run away and do not stop for two or three days, I think that is stavisism; they have the instinctive feeling that their ancestors, thirty or forty generations ago perhaps, were bound at camp fires, and now they have a feeling that human beings are their very worst enemies, and that their ancestors have been the slaves of man. I found one shepherd who had caught a wild camel only some days old, and that camel lived for a year and some weeks quite tame. Now you understand that you could not do that with a quite wild animal in a few days.

As to the routes of the birds, I do not know anything. Prjevalsky has given a very interesting explanation of the highways of the Siberian birds when going back to India. I don't remember it, as that is not my speciality; but Prjevalsky writes on the subject very ably.

Then, as to the remarks of Mr. Delmar Morgan, I did not get quite a clear impression of his opinions, and fear that I did not understand all that he said. I am glad to hear the opinion of Mr. Delmar Morgan, who has paid a great deal of attention to the Lob-nor question, but I think practical observation at the very place is more important than theory and the study of books and maps. It would be very interesting to know how Mr. Delmar Morgan, who has opinions differing from mine, explains the existence and formation of the river-bed found by Kozloff at the foot of Kuruk Yagh going eastwards as a continuation of the Tarim river; how he understands the existence of the old river-bed I found at Merdak-shahr, and another by Pevtsoff further south, and the new river-beds found by Prjevalsky? I think the river-beds give the best argument for the statement that Lob-nor is a wandering lake, and that the Tarim as well as the southern basin has moved. Only the region about the northern lake is called Lob-nor, a name absolutely unknown round the southern lake. How does he explain the absolute absence of forest round the southern lake when the whole hydrographic system of the Tarim is rich in poplar; and, lastly, the historical tradition of the inhabitants themselves, who told me that their grandfathers dwelt at a lake to the north of the southern basin? I got information from them so correctly that I could calculate that the southern basin can only be 200 years old, formed, I should think, about 1720; and in the book of General Pevtsoff, published a very little time ago, you will find proofs of the same fact.* He heard from the inhabitants of the southern basin that their grandfathers had dwelt at another lake to the north. About Marco Polo Mr. Delmar Morgan is quite

* Pevtsoff writes in his work, 'Trudii Tibetakoi Expeditsii, 1889-90,' p. 305: "The river Yarkand-darya flowed 200 yards, according to tradition, to the north of its present bed, and discharged into the small lake Ushu-kul, which is communicated by a channel with Lop-nor."

right; it is not a good argument. It is, nevertheless, very interesting to observe that Marco Polo, who passed the city of Lob, does not mention the lake Lob-nor; but that is a bad argument, because he does not mention the Yarkand-, Khotan-, and Cherchen-dariss, and he must have had a difficult passage through these rivers; and he does not mention the Kuen Lun, one of the highest mountain ranges on the Earth. I am, nevertheless, very glad to hear Mr. Delmar Morgan's opinion.

The PRESIDENT: The meeting will, I am sure, have gathered that we have only heard a very small part of the work done by Dr. Sven Hedin. He has touched upon his ascent of Mustagh-ata. You have only to look at his diagrams to see the work he did round that mountain. Look at the way he has mapped out all the glaciers that descend from it, and I may add that he spent four months on the necessary surveys. It is the same with the desert. I saw with what thrilling interest the whole meeting listened to Dr. Hedin's graphic account of the dangers he encountered and overcame in that desert, and I heard a sigh of relief from the audience when Dr. Hedin described how he heard the duck splash into the pond, and was able to fill his boots with water to take to his dying companion. There are interesting questions connected with that moving sand and the time it takes in working across the desert. Sir Douglas Forsyth gives us some interesting remarks on the rate of travel of sand, calculated from observations on buildings on the edge of the desert. All the points and questions connected with the Keria-daria and the other rivers which lose themselves in the desert, and with the supply of water, will no doubt be further treated in Dr. Hedin's book; also the discovery of entirely new country along the Kuen Lun, and his discussion of the Lob-nor question. We have now the honour of welcoming here His Excellency the Swedish minister, and I wish to say to him how truly the Royal Geographical Society feels the debt of gratitude it owes to his Majesty the King of Sweden, for having, with such enlightened liberality, sent forward or assisted to send forward so many geographical expeditions, and more especially the expedition of Dr. Sven Hedin—I believe very largely supported by the King of Sweden—and for His Majesty's appreciation of the work of geographers by recognizing their splendid journeys on their return to their native country. I am glad to say that Dr. Sven Hedin has been decorated by his Majesty, not only with the Order of the North Star, but with the order in diamonds, a distinction which I believe has only been received by three other members of that order. You will, I am sure, pass with acclamation a vote of thanks to Dr. Hedin himself, and your thanks will include not only the work that he has done in Central Asia, and the perils he has undergone for the sake of our science, but also your thanks will include the deeply interesting and admirably delivered address which we have heard this evening, as well as the numerous beautiful illustrations by himself, and the splendid diagrams he has brought over to show us, also drawn entirely by himself. I see that it is carried by acclamation; I therefore offer your vote of thanks to Dr. Sven Hedin. Some of the most interesting things he has brought back, have just been put into my hands—drawings of the patterns and figures of Buddha sitting on lotuses, which he found on the walls of that buried city in the desert.
